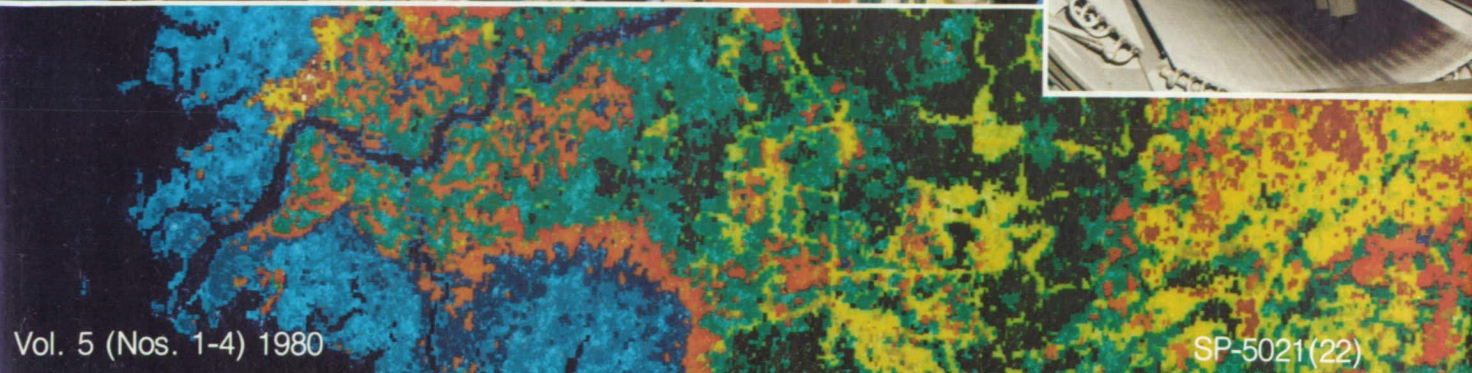


# NASA Tech Briefs Index 1980

National  
Aeronautics and  
Space  
Administration



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# INTRODUCTION

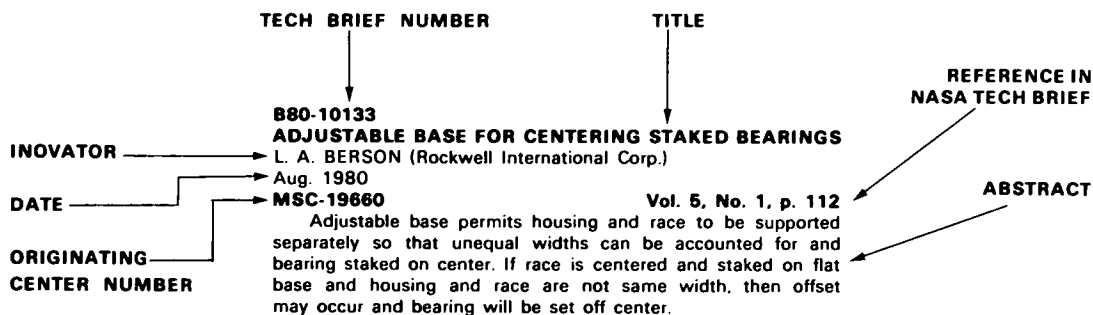
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This *Index to NASA Tech Briefs* contains abstracts and four indexes -- subject, personal author, originating Center, and Tech Brief number -- for 1980 Tech Briefs.

## Abstract Section

The abstract section is divided into nine categories: Electronic Components and Circuits; Electronic Systems; Physical Sciences; Materials; Life Sciences; Mechanics; Machinery; Fabrication Technology; and Mathematics and Information Sciences. Within each category, abstracts are arranged sequentially by Tech Brief number.

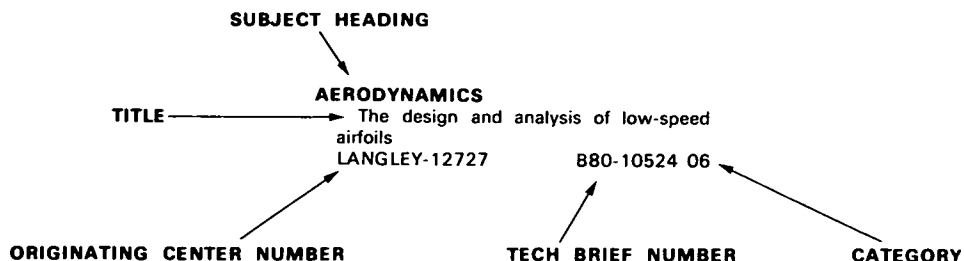
A typical abstract entry has these elements:



The originating Center number in each entry includes an alphabetical prefix that identifies the NASA Center where the Tech Brief originated. A list of prefixes and the corresponding Center names are given on page iii.

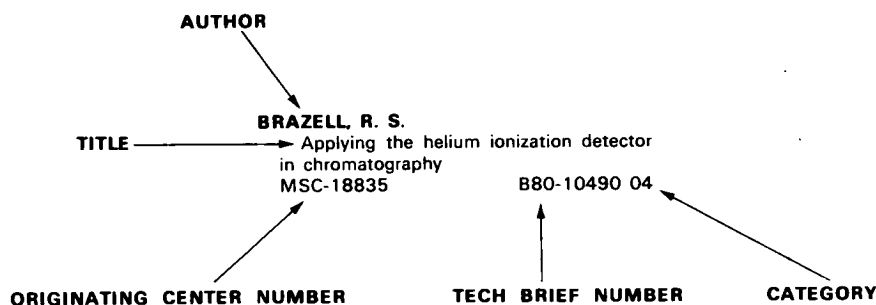
## Indexes

Four indexes are provided. The first is a subject index, arranged alphabetically by subject heading. Each entry in the subject index includes a Tech Brief number and a category number to aid the user in locating pertinent entries in the abstract section.

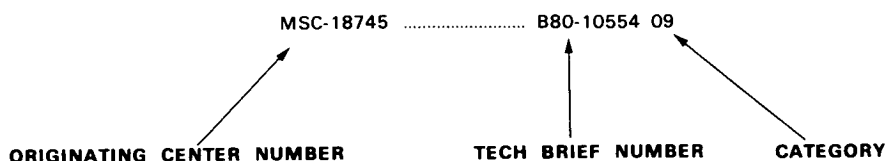


The January 1976 edition of the *NASA Thesaurus* (NASA SP-7050) is used as the authority for the indexing vocabulary that appears in the subject index. The *NASA Thesaurus* should be consulted in examining the current indexing vocabulary, including associated cross-reference structure. Only the subject terms that have been selected to describe the documents abstracted in this issue appear in the subject index. Copies of the *NASA Thesaurus* may be obtained from the National Technical Information Service at \$23.50 for the two-volume set.

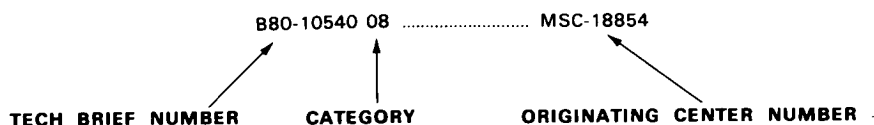
The second index is a personal author index. Entries in this index are arranged alphabetically by author's name. Tech Brief and category numbers are supplied to help the user find the appropriate entries in the abstract section.



The third index relates each originating Center number to the corresponding Tech Brief number and category. Entries in this index are arranged in alphanumeric order by Center number.



The fourth index relates each Tech Brief number to its originating Center number. Entries are arranged in ascending Tech Brief number order.





## Originating Center Prefixes

ARC	Ames Research Center
GSFC	Goddard Space Flight Center
HQ	NASA Headquarters
KSC	Kennedy Space Center
LANGLEY	Langley Research Center
LEWIS	Lewis Research Center
M-FS	Marshall Space Flight Center
MSC	Johnson Space Center (formerly Manned Spacecraft Center)
NPO	Jet Propulsion Laboratory/NASA Pasadena Office

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# Index to NASA Tech Briefs

June 1981

## Abstract Section

### 01 ELECTRONIC COMPONENTS AND CIRCUITS

**B80-10001**

**MULTIBAND MICROSTRIP ANTENNA**

I. YU (Lockheed Electronics Co., Inc.)

Aug. 1980

**MSC-18334**

**Vol. 5, No. 1, p. 3**

Compact antenna transmits and receives elliptically and circularly polarized radiation. Antenna consists of layers of elliptical disks separated by dielectric substrates. Each disk operates at frequency determined by its size and dielectric constant of substrate. Individual frequency bands can be made to overlap, to yield single broadband antenna. Standard microstrip techniques are used to build it.

**B80-10002**

**SIMPLE CIRCUIT MONITORS 'THIRD WIRE' IN AC LINES**

T. T. KOJIMA (Rockwell International Corp.) and D. E. STUCK (Rockwell International Corp.)

Aug. 1980

**M-FS-19457**

**Vol. 5, No. 1, p. 4**

Device detects interruption of ground connection in three-wire electrical equipment and shuts off ac power to prevent shock hazard. Silicon-controlled rectifiers detect floating ground, and deenergize optoelectric relays thereby breaking power connections. Circuit could be incorporated into hand tools, appliances, and other electrical equipment.

**B80-10003**

**SIMPLE BUCK/BOOST VOLTAGE REGULATOR**

J. PAULKOVICH and G. E. RODRIGUEZ

Aug. 1980

**GSFC-12360**

**Vol. 5, No. 1, p. 5**

Circuit corrects low or high supply voltage, produces regulated output voltage. Circuit has fewer components because inductor/transformer combination and pulse-width modulator serve double duty. Regulator handles input voltage variation from as low as one half output voltage to as high as input transistor rating. Solar arrays, fuel cells, and thermionic generators might use this regulator.

**B80-10004**

**INDEPENDENT SYNCHRONIZER FOR DIGITAL DECODERS**

J. J. STIFFLER (Raytheon Co.)

Aug. 1980

**MSC-16723**

**Vol. 5, No. 1, p. 6**

Logic circuit synchronizes branches of any convolution code-decoder at low signal to noise ratios. Parity checks determine correct node synchronization. Device maintains synchrony as low as -3 dB. Circuit consists of 15 stage shift register, three up down counters, and some logic gates.

**B80-10005**

**MULTICHANNEL COINCIDENCE CIRCUIT**

J. I. CLEMMONS, JR.

Aug. 1980

**LANGLEY-12531**

**Vol. 5, No. 1, p. 7**

Digital circuit detects coincident pulses in two or more channels, and records time between primary pulses that are coincident with secondary pulses. Circuit has three major blocks: interval time subcircuit, measurement control subcircuit, and time sequence generator. Timer can be used in laser velocimeter or other instruments receiving data at irregular rates from two or more sources.

**B80-10006**

**UNIVERSAL ODD-MODULUS FREQUENCY DIVIDER**

A. ENGEL (Caltech)

Aug. 1980

**NPO-13426**

**Vol. 5, No. 1, p. 8**

Simple circuit divides frequency by preselected odd number. Exclusive-OR gate, divide-by-N circuit, and flip-flop are only components. Input pulses must be symmetrical.

**B80-10007**

**DETECTING SHORT CIRCUITS DURING ASSEMBLY**

G. J. DEBOO

Aug. 1980

**ARC-11116**

**Vol. 5, No. 1, p. 9**

Detector circuit identifies shorts between bus bars of electronic equipment being wired. Detector sounds alarm and indicates which planes are shorted. Power and ground bus bars are scanned continuously until short circuit occurs.

**B80-10008**

**CONTINUOUS CONTROL OF PHASE-LOCKED-LOOP BANDWIDTH**

G. W. MOTAL (Lockheed Electronics Co., Inc.) and J. C. VANELLI (Lockheed Electronics Co., Inc.)

Aug. 1980

**MSC-16684**

**Vol. 5, No. 1, p. 10**

Tracking loop filter with continuous bandwidth control smooths transition from wide to narrow band. Circuit was designed for Space Shuttle where bandwidth varied between 320 Hz for acquisition and 20 Hz for tracking. Field-effect transistor (FET) acts as voltage controlled variable resistance, changing time constant of filter between phase detector and voltage-controlled oscillator in phase-locked loop.

**B80-10009**

**PHOTOCAPACITIVE IMAGE CONVERTER**

W. E. MILLER, A. SHER (College of William and Mary), and Y. H. TSUO (College of William and Mary)

Aug. 1980

**LANGLEY-12513**

**Vol. 5, No. 1, p. 11**

Solid-state converters yield high sensitivity at high information-retrieval speed. Main advantages are high sensitivity of photocapacitive mechanism and inherent speed of information



## 01 ELECTRONIC COMPONENTS AND CIRCUITS

retrieval method. Fabrication of both devices is relatively simple and inexpensive.

### B80-10010

#### CROSSED-GRID CHARGE LOCATOR

D. C. HARRISON (American Science and Engineering, Inc.)

Aug. 1980

M-FS-25170

Vol. 5, No. 1, p. 12

Circuit locates center of cloud of charge on wire grid to within 6.5 micrometers. Wires in vicinity of charge cloud develop voltages that are processed by priority encoders to develop coarse and fine position codes. Device is used with microchannel plate amplifier in X-ray photon detectors, electron microscopes, and closed-circuit television.

### B80-10011

#### SEMICONDUCTOR STEP-STRESS TESTING

Innovator not given (Special Products Division of DCA Reliability Laboratory) Aug. 1980 See also B80-10012 - B80-10030

M-FS-25329

Vol. 5, No. 1, p. 13

Report describes extensive program to test behavior of discrete diodes and transistors subjected to power and temperature overstress. Commercially available bipolar and field effect transistors and diodes were stressed between 0.5 and 1.75 times maximum rated power. Two groups were temperature stressed: 160 hour steps starting at 75 C to maximum of 300 C. Cumulative failures and changes in device parameters were monitored and reasons for failures presented.

### B80-10012

#### JANTX1N2970B ZENER DIODE

Innovator not given (Special Products Division of DCA Reliability Laboratory) Aug. 1980 See also B80-10011; B80-10013 - B80-10030

M-FS-25260

Vol. 5, No. 1, p. 14

Report evaluates effects of power and temperature overstress on General Semiconductor and Siemens devices. Excessive failure rates limited testing. Failure modes are described.

### B80-10013

#### JANTX1N2989B ZENER DIODE

Innovator not given (Special Products Division of DCA Reliability Laboratory) Aug. 1980 See also B80-10011; B80-10012; B80-10014; B80-10030

M-FS-25261

Vol. 5, No. 1, p. 14

Report evaluates effects of power and temperature overstress on General Semiconductor and Siemens devices. Mechanical disruption is prominent failure mode. Other failures are described.

### B80-10014

#### JANTX1N3016B ZENER DIODE

Innovator not given (Special Products Division of DCA Reliability Laboratory) Aug. 1980 See also B80-10011 - B80-10013; B80-10015; B80-10030

M-FS-25262

Vol. 5, No. 1, p. 14

Report evaluates effects of power and temperature overstress on Motorola and Siemens devices. Reverse bias leakage maximum limit failure and Zener-breakdown maximum limit failure were common. Other failures are described.

### B80-10015

#### JANTX1N3031B ZENER DIODE

Innovation not given (Special Products Division of DCA Reliability Laboratory) Aug. 1980 See also B80-10011 - B81-10014; B80-10016; B80-10030

M-FS-25263

Vol. 5, No. 1, p. 14

Report describes effects of power and temperature overstress on Motorola and Siemens diodes. Failure was predominantly due to melted metal on die connections. Other failures are described.

### B80-10016

#### JANTX1N5622 DIODE

Innovator not given (Special Products Division of DCA Reliability Laboratory) Aug. 1980 See also B80-10011 - B80-10015; B80-10017; B80-10030

### M-FS-25280

Vol. 5, No. 1, p. 15

Report describes effects of power and temperature overstress on Semtech and Micro Semiconductor diodes. Semtech devices failed with excessive reverse bias leakage due to external paint. Micro Semiconductor diodes had reverse bias leakage failure due to damaged silicon.

### B80-10017

#### JANTX1N5623 SWITCHING DIODE

Innovator not given (Special Products Division of DCA Reliability Laboratory) Aug. 1980 See also B80-10011 - B80-10016; B80-10018; B80-10030

M-FS-25281

Vol. 5, No. 1, p. 15

Report describes effects of power and temperature overstress on Semtech and Micro Semiconductor devices. Only two Semtech diodes failed catastrophically. Testing on Micro Semiconductor devices stopped because failure limit was reached. Micro diodes suffered lead separation.

### B80-10018

#### JANTX2N2060 DUAL TRANSISTOR

Innovator not given (Special Products Division of DCA Reliability Laboratory) Aug. 1980 See also B80-10011 - B80-10017; B80-10019; B80-10030

M-FS-25251

Vol. 5, No. 1, p. 15

Report describes effects of power and temperature overstress on Motorola and Raytheon devices. Motorola devices were weak in power overstress. Raytheon devices succumbed to 160 hour temperature stress. Failure modes are detailed.

### B80-10019

#### JANTX2N2219A DUAL TRANSISTOR

Innovator not given (Special Products Division of DCA Reliability Laboratory) Aug. 1980 See also B80-10011 - B80-10018; B80-10020; B80-10030

M-FS-25252

Vol. 5, No. 1, p. 15

Report describes effects of power and temperature overstress on Texas Instruments and National Semiconductor devices. Texas Instruments devices had only two failures in 2500 hours of testing. National Semiconductor devices reached 50% failure limit. No consistent failure mode was detected.

### B80-10020

#### JANTX2N2369A TRANSISTOR

Innovator not given (Special Products Division of DCA Reliability Laboratory) Aug. 1980 See also B80-10011 - B80-10019; B80-10021; B80-10030

M-FS-25254

Vol. 5, No. 1, p. 16

Report describes effects of power and temperature overstress on National Semiconductor and Raytheon transistors. Good junction quality was maintained. Gain losses predominated. Other failures are reported.

### B80-10021

#### JANTX2N2432A TRANSISTOR

Innovator not given (Special Products Division of DCA Reliability Laboratory) Aug. 1980 See also B80-10011 - B80-10020; B80-10022; B80-10030

M-FS-26255

Vol. 5, No. 1, p. 16

Report evaluates effects of power and temperature overstress on Crystalonics and Texas Instruments devices. Crystalonics devices survived better, as Texas Instruments lot exceeded 50 percent failure at 225 deg C. Failure modes are evaluated.

### B80-10022

#### JANTX2N2484 TRANSISTOR

Innovator not given (Special Products Division of DCA Reliability Laboratory) Aug. 1980 See also B80-10011 - B80-10021; B80-10023; B80-10030

M-FS-25253

Vol. 5, No. 1, p. 16

Report evaluates effects of power and temperature overstress on Raytheon and Teledyne devices. Power overstress produced few failures. Both lots of devices exceeded 50 percent failure at 250 deg C. Failure modes are evaluated.

**B80-10023****JANTX2N2605 TRANSISTOR**

Innovator not given (Special Products Division of DCA Reliability Laboratory) Aug. 1980 See also B80-10011 - B80-10022; B80-10024; B80-10030

**M-FS-25150**

Vol. 5, No. 1, p. 16

Report evaluates effects of power and temperature overstress on Raytheon and National Semiconductor devices. Breakdown voltage hysteresis, possibly due to contamination of semiconductor by gold from leads, was prominent.

**B80-10024****JANTX2N2905A TRANSISTOR**

Innovator not given (Special Products Division of DCA Reliability Laboratory) Aug. 1980 See also B80-10011 - B80-10023; B80-10025; B80-10030

**M-FS-25256**

Vol. 5, No. 1, p. 17

Report evaluates effects of power and temperature overstress on Motorola and Texas Instruments devices. A variety of failure modes are described.

**B80-10025****JANTX2N2920 DUAL TRANSISTOR**

Innovator not given (Special Products Division of DCA Reliability Laboratory) Aug. 1980 See also B80-10011 - B80-10024; B80-10026; B80-10030

**M-FS-25258**

Vol. 5, No. 1, p. 17

Report describes effects of power and temperature overstress on Fairchild and National Semiconductor devices. 160 hour temperature stress was only test to cause notable damage. Loss of gain is principal failure mode.

**B80-10026****JANTX2N2945A TRANSISTOR**

Innovator not given (Special Products Division of DCA Reliability Laboratory) Aug. 1980 See also B80-10011 - B80-10025; B80-10027; B80-10030

**M-FS-25259**

Vol. 5, No. 1, p. 17

Report describes effects of power and temperature overstress on Raytheon and Teledyne devices. Increasing T in 16 hour steps damaged both manufacturers' lots. Raytheon lot exceeded 50 percent failure rate 160 hours before completion of test due to current gain failure. Teledyne samples completed test but had more catastrophic failures.

**B80-10027****JANTX2N3637 TRANSISTOR**

Innovator not given (Special Products Division of DCA Reliability Laboratory) Aug. 1980 See also B80-10011 - B80-10026; B80-10028; B80-10030

**M-FS-25264**

Vol. 5, No. 1, p. 17

Report describes effects of power and temperature overstress on Transistor and Motorola devices. Transistor batches exceeded 50 percent failure in power overstress and 160 hour temperature stress. Design differences are evaluated.

**B80-10028****JANTX2N3811 DUAL TRANSISTOR**

Innovator not given (Special Products Division of DCA Reliability Laboratory) Aug. 1980 See also B80-10011 - B80-10027; B80-10029; B80-10030

**M-FS-25265**

Vol. 5, No. 1, p. 18

Report evaluates effects of power and temperature overstress on Motorola and National Semiconductor devices. National Semiconductor devices exceeded 50 percent failure after 160 hours at 225 deg C. Motorola suffered more rejects but failures occurred at 300 deg C. Difference in lead bonding technique may explain performance.

**B80-10029****JANTX2N4150 TRANSISTOR**

Innovator not given (Special Products Division of DCA Reliability Laboratory) Aug. 1980 See also B80-10011 - B80-10028; B80-10030

**M-FS-25267**

Vol. 5, No. 1, p. 18

Report evaluates effects of power and temperature overstress

on General Semiconductor and Transistor devices. General Semiconductor lot exceeded 50 percent failure 500 hours into 125 percent maximum rated power test. Catastrophic failure rates differed between manufacturers. Modes of failure are analyzed.

**B80-10030****JANTX2N4856 FIELD-EFFECT TRANSISTOR**

Innovator not given (Special Products Division of DCA Reliability Laboratory) Aug. 1980 See also B80-10011 - B80-10029

**M-FS-25269**

Vol. 5, No. 1, p. 18

Report evaluates effects of power and temperature overstress on Teledyne and Texas Instruments devices. Temperature stress caused most failures for both manufacturers' lots. Failure modes are analyzed.

**B80-10149****IMPROVED POWER FACTOR CONTROLLER**

F. J. NOLA

Sep. 1980 See also B77-10154; B79-10004

**M-FS-25323**

Vol. 5, No. 2, p. 133

Power dissipation in ac induction motor is reduced by circuit that lowers applied voltage when motor is idling or only lightly loaded. Timing voltages in phase with motor current are sensed a cross gate-controlled semiconductor which with motor, rather than across high-power resistor, as in earlier version.

**B80-10150****ENERGY SAVING IN AC GENERATORS**

F. J. NOLA

Sep. 1980 See also B80-10149

**M-FS-25302**

Vol. 5, No. 2, p. 134

Circuit cuts no-load losses, without sacrificing full-load power. Phase-control circuit includes gate-controlled semiconductor switch that cuts off applied voltage for most of ac cycle if generator idling. Switch 'on' time increases when generator is in operation.

**B80-10151****'PELLED-FILM' SOLAR CELLS**

R. J. STIRN (Caltech)

Sep. 1980

**NPO-14734**

Vol. 5, No. 2, p. 135

Cells are lighter and less expensive than conventional cells. GaAs cells are deposited on GaAs substrate coated with thin etchable layer that allows completed cell film to be peeled away from substrate. At estimated conversion of 18 percent, array of cells delivers about 1 kW of electricity per kilogram of cell material. Blanket of cells delivers energy at power-to-weight ratio about 4 times that of conventional 2-mil (0.5-mm) silicon solar cells. GaAs solar cells have better radiation resistance than silicon cells.

**B80-10152****TEMPERATURE-COMPENSATING DC RESTORER**

H. M. THOMAS (Martin Marietta Corp.)

Sep. 1980

**LANGLEY-12549**

Vol. 5, No. 2, p. 136

Circuit provides stable references restoration in addition to temperature compensation. Possible TV monitor applications include traffic and security surveillance systems, where cameras are subject to environmental extremes, as in unheated warehouses or outdoors.

**B80-10153****ALIASING FILTER FOR MULTIRATE SYSTEMS**

J. F. L. LEE (Honeywell, Inc.)

Sep. 1980

**MSC-18472**

Vol. 5, No. 2, p. 137

Rolloff filter is inexpensive way of reducing aliasing in digital control systems. Rolloff filter operating at faster sample rate (or rates) of system with 2:1 rate ratio gives infinite attenuation at half-sample rate of fast-rate loop. Tested successfully on Space Shuttle primary flight-control systems, filter technique could be applied to other multirate sampled-data systems.

## 01 ELECTRONIC COMPONENTS AND CIRCUITS

### B80-10154

#### DUAL-FREQUENCY BIDIRECTIONAL ANTENNA

W. H. KUMMER (Hughes Aircraft Co.)

Sep. 1980

GSFC-12501

Vol. 5, No. 2, p. 138

Simultaneous two-way communication at 20 and 30 GHz is possible with versatile paraboloid-dish antenna. Developed for two-way communications between Space Shuttle and ground station, antenna includes parabolic reflector, feed horn, waveguide network, and single-axis gimbal-mounting. System resolution and accuracy are better than 1 percent.

### B80-10155

#### COMPUTER-CONTROLLED WARMUP CIRCUIT

J. J. DAEGES (Caltech)

Sep. 1980

NPO-14815

Vol. 5, No. 2, p. 139

Filament of high-power radio transmitter is brought to operating temperature automatically. Pushbutton reduces operator's role to one-step command and is compatible with various forms of computer control. Filament shutdown is initiated by 'down' command from operator, failure of cooling systems, or power failure for more than few seconds.

### B80-10156

#### DIRECT-CURRENT CONVERTER FOR GAS-DISCHARGE LAMPS

P. LUTUS (ILC Technology)

Sep. 1980

MSC-18407

Vol. 5, No. 2, p. 140

Metal/halide and similar gas-discharge lamps are powered from low-voltage dc source using small efficient converter. Converter is useful whenever 60-cycle ac power is not available or where space and weight allocations are limited. Possible applications are offshore platforms, mobile homes, and emergency lighting. Design innovations give supply high reliability and efficiency up to 75 percent.

### B80-10157

#### POSITION MONITOR FOR MINING MACHINES

J. LUBICH (Benton Corp.)

Sep. 1980

M-FS-25342

Vol. 5, No. 2, p. 141

Circuit at output of incremental transducer records progress of longwall shearer. In contrast to mechanical shaft encoders, electronic circuit can be easily packaged to withstand shock and vibration of mining machine as it cuts across coal seam.

### B80-10158

#### 11-LINE TO 512-LINE DECODER

W. N. MILLER (Rockwell International Corp.)

Sep. 1980

MSC-19751

Vol. 5, No. 2, p. 141

CMOS decoder is assembled from standard 4-line to 16-line decoder/demultiplexer IC's. Matrix may also be used to generate 256 latched-on or latched-off logic signals instead of 512 discrete unlatched signals. By using conventional CMOS IC's, circuit consumes only about 30 milliwatts.

### B80-10159

#### INPUT/OUTPUT INTERFACE MODULE

E. M. OZYAZICI (Rockwell International Corp.)

Sep. 1980

MSC-18180

Vol. 5, No. 2, p. 143

Module detects level changes in any of its 16 inputs, transfers changes to its outputs, and generates interrupts when changes are detected. Up to four changes-in-state per line are stored for later retrieval by controlling computer. Using standard TTL logic, module fits 19-inch rack-mounted console.

### B80-10160

#### SMOOTHING THE OUTPUT FROM A DAC

C. WAGNER

Aug. 1980

FRC-11025

Vol. 5, No. 2, p. 144

Circuit smooths stepped waveform from analog-to-digital

converter without appreciable phase shift between stepped input signal and smoothed output signal and without any effect from stepping rate. Waveform produced is suitable for driving controls used in manufacturing processes, aerospace systems, and automobiles.

### B80-10161

#### LSI LOGIC FOR PHASE-CONTROL RECTIFIERS

C. DOLLAND (Airsearch Manufacturing Co.)

Sep. 1980

M-FS-25208

Vol. 5, No. 2, p. 144

Signals for controlling phase-controlled rectifier circuit are generated by combinatorial logic than can be implemented in large-scale integration (LSI). LSI circuit saves space, weight, and assembly time compared to previous controls that employ one-shot multivibrators, latches, and capacitors. LSI logic functions by sensing three phases of ac power source and by comparing actual currents with intended currents.

### B80-10162

#### MODEL FOR MOS FIELD-TIME-DEPENDENT BREAKDOWN

S. P. LI (Caltech), J. MASERJIAN (Caltech), and S. PRUSSIN (Caltech)

Sep. 1980

NPO-14701

Vol. 5, No. 2, p. 145

Quantitative model for MOC breakdown is derived and correlated with experiments.

### B80-10163

#### DDL: DIGITAL SYSTEMS DESIGN LANGUAGE

S. G. SHIVAL (Alabama Univ.)

Sep. 1980

M-FS-25352

Vol. 5, No. 2, p. 146

Hardware description languages are valuable tools in such applications as hardware design, system documentation, and logic design training. DDL is convenient medium for inputting design details into hardware-design automation system. It is suitable for describing digital systems at gate, register transfer, and major combinational block level.

### B80-10294

#### ULTRASTABLE AUTOMATIC FREQUENCY CONTROL

D. J. SABOURIN (Motorola, Inc.) and A. FURIGA (Motorola, Inc.)

Jan. 1981

MSC-18679

Vol. 5, No. 3, p. 267

Center frequency of wideband AFC circuit drifts only hundredths of percent per day. Since circuit responds only to slow frequency drifts and modulation signal has high-pass characteristics, AFC does not interfere with normal FM operation. Stable oscillator, reset circuit, and pulse generator constitute time-averaging discriminator; digital counter in pulse generator replaces usual monostable multivibrator.

### B80-10295

#### FAST MICROWAVE SWITCHING POWER DIVIDER

R. W. JOHNSON (Ball Corp.) and R. J. STOCKTON (Ball Corp.)

Jan. 1981

GSFC-12420

Vol. 5, No. 3, p. 268

Unit divides power from single input among any 12 of 120 output terminals and redistributes it in 6 microseconds. Microwave current from coaxial line excites disk feeding many radial strip transmission lines. Built for use in electronically-steered S-band antenna, device also divides and switches energy among filters and phase shifters.

### B80-10296

#### HIGH-POWER SOLID-STATE MICROWAVE TRANSMITTER

J. D. BOREHAM (Caltech), B. L. CONROY (Caltech), R. B. POSTAL (Caltech), and D. G. YENCHE (Caltech)

Jan. 1981

NPO-14803

Vol. 5, No. 3, p. 269

Transmitter phases outputs from individual amplifier modules then combines them in multielement array feed antenna. Size and power capability of system are variable for radar and small-angle scanning applications.

**B80-10297****ANTENNA FEED FOR LINEAR AND CIRCULAR POLARIZATION**

D. A. BATHKER (Caltech) and B. L. SEIDEL (Caltech)

Jan. 1981

**NPO-14810**

Vol. 5, No. 3, p. 270

Antenna system transmits linearly-polarized microwave radio signal, yet circularly-polarized incoming signal is received without polarization-mismatch losses. Network uses only hybrid junctions, diplexer, and four-probe antenna; no waveguide switches are required. Other circuit arrangements are possible, using additional transmitters and receivers.

**B80-10298****SIGNAL CONDITIONER FOR NICKEL TEMPERATURE SENSORS**

R. R. WALKER (Rockwell International Corp.)

Jan. 1981

**MSC-18367**

Vol. 5, No. 3, p. 270

Simple circuit conditions output of 50 ohm sensor for readout on strainage recorder. It consists of resistors, switch, and 'matching' network. Device saves time and reduced instrumentation costs when strain and temperature are measured in same setup.

**B80-10299****EFFICIENT, LIGHTWEIGHT DC/DC SWITCHING CONVERTER**

S. CUK (Caltech) and R. D. MIDDLEBROOK (Caltech)

Jan. 1981 See also NASA-CR-135174(N78-29351)

**LEWIS-12809**

Vol. 5, No. 3, p. 271

Converters have input properties of boost power stage and output properties of buck power stage, yet they perform general conversion function with high efficiency. Other features include non-pulsating input/output currents, use of capacitive energy transfer, low output voltage ripple, reduced EMI, and small size.

**B80-10300****28-CHANNEL ROTARY TRANSFORMER**

W. T. MCILYMAN (Caltech)

Jan. 1981

**NPO-14861**

Vol. 5, No. 3, p. 273

Transformer transmits power and digital data across rotating interface. Array has many parallel data channels, each with potential 1 megabaud data rate. Ferrite-cored transformers are spaced along rotor; airgap between them reduces crosstalk.

**B80-10301****IMPROVING MOS MINORITY-CARRIER LIFETIME**

R. H. COCKRUM (Caltech), S. P. LI (Caltech), and S. PRUSSIN (Caltech)

Jan. 1981

**NPO-14738**

Vol. 5, No. 3, p. 273

Fluorine implantation increases minority-carrier lifetime in silicon by factor of 100, enhancing power efficiency in MOS applications. Implantation does not increase microdefects at silicon surface when thin oxide layers are grown, and process gathers existing impurities near surface without adversely affecting MOS electrical parameters. With these advantages, fluorine may be left on wafer surfaces after processing.

**B80-10302****COOLING/GROUNDING MOUNT FOR HYBRID CIRCUITS**

B. BAGSTAD (TRW, Inc.), R. ESTRADA (TRW, Inc.), and H. MANDEL (TRW, Inc.)

Jan. 1981

**MSC-18728**

Vol. 5, No. 3, p. 274

Extremely short input and output connections, adequate grounding, and efficient heat removal for hybrid integrated circuits are possible with mounting. Rectangular clamp holds hybrid on printed-circuit board, in contact with heat-conductive ground plate. Clamp is attached to ground plane by bolts.

**B80-10424****ALIGNING SLEEVE FOR OPTICAL FIBERS**

K. L. AUSTIN (Lockheed Electronics Co.)

Jan. 1981

**MSC-18756**

Vol. 5, No. 3, p. 389

Sleeve for aligning two optical fibers is made with precisely correct inside diameter by using section of fiber as mandrel. Because optical fiber is manufactured to very close tolerances, diameter of section serving as mandrel will be same as diameters of two fibers that are mated in butt joint inside sleeve. Result, determined by experiments, is loss of no more than 0.3 dB at joint.

**B80-10440****IMPROVED BATTERY CHARGER FOR ELECTRIC VEHICLES**

W. E. RIPPEL (Caltech)

Apr. 1981

**NPO-14964**

Vol. 5, No. 4, p. 411

Polyphase version of single-phase 'boost chopper' significantly reduces ripple and electromagnetic interference (EMI). Drive circuit of n-phase boost chopper incorporates n-phase duty-cycle generator; inductor, transistor, and diode compose chopper which can run on single-phase or three-phase alternating current or on direct current. Device retains compactness and power factors approaching unity, while improving efficiency.

**B80-10441****MULTIJUNCTION HIGH-VOLTAGE SOLAR CELL**

J. C. EVANS, JR., C. GORADIA, and A. T. CHAI

Apr. 1981 See also NASA-TM-81389(N80-16914)

**LEWIS-13400**

Vol. 5, No. 4, p. 412

Multijunction cell allows for fabrication of high-voltage solar cell on single semiconductor wafer. Photovoltaic energy source using cell is combined on wafer with circuit it is to power. Cell consists of many voltage-generating regions internally or externally interconnected to give desired voltage and current combination. For computer applications, module is built on silicon wafer with energy for internal information processing and readouts derived from external light source.

**B80-10442****SOLAR CELL IS HOUSED IN LIGHT-BULB ENCLOSURE**

J. C. EVANS, JR.

Apr. 1981 See also B80-10441

**LEWIS-13418**

Vol. 5, No. 4, p. 413

Inexpensive, conventional solar-cell module uses focusing principle of electric lamp in reverse to produce electric power from sunlight. Standard outdoor light enclosure provides low-cost housing which concentrates sunlight in solar cell. Unit is capable of producing approximately 1 watt of electric power.

**B80-10443****SIMPLE JFET OSCILLATOR**

L. L. KLEINBERG

Apr. 1981

**GSFC-12555**

Vol. 5, No. 4, p. 413

Device used in mixers, modulators, and function generators provides stable sine-wave signal compatible with both integrated circuits and discrete-component assemblies. Oscillator's frequency is tunable over narrow band about design value. Frequency range, stability, linearity, and low power drain of device are suited to communications receivers and transmitters and digital microprocessors, computers, and displays. Circuit simplicity allows for easy monolithic construction.

**B80-10444****SPEED CONTROL FOR SYNCHRONOUS MOTORS**

H. PACKARD (Northrop Corp.) and J. SCHOTT (Northrop Corp.)

Apr. 1981

**MSC-18680**

Vol. 5, No. 4, p. 44

Feedback circuit controls fluctuations in speed of synchronous ac motor. Voltage proportional to phase angle is developed by phase detector, rectified, amplified, compared to threshold, and reapplied positively or negatively to motor excitation circuit. Speed control reduces wow and flutter of audio turntables and tape recorders, and enhances hunting in gyroscope motors.

**B80-10445****LOW-RESISTANCE CONTINUITY TESTER**



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R. B. REASONER (Caltech)

Apr. 1981

**NPO-14881**

Vol. 5, No. 4, p. 45

IC printed-circuit board tester measures resistance as low as 0.1 ohm but uses little power. Two 4.7 kilohm resistors and connected transistors prevent current flow through operational amplifier until probe circuit is complete, eliminating need for on/off switch. Zener diode in series with amplifier output prevents audio oscillator operation until output has sufficient amplitude. Circuit utilizes 741 operational amplifier on 11.2 volt battery or lower voltage amplifiers.

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**B80-10031**

**MICROPROCESSOR-CONTROLLED DATA SYNCHRONIZER**

S. W. HOUSTON (TRW, Inc.), D. R. MARTIN (TRW, Inc.), and L. R. STINE (TRW, Inc.)

Aug. 1980

**MSC-18535**

Vol. 5, No. 1, p. 21

Versatile receiver processes data at variety of rates and code formats. Functions performed are: bit detection, NRZ-L conversion, frame synchronization (with programmable word length), bit-sync acquisition and tracking, error-curve normalization, lock detection, half-bit-ambiguity resolution, and data-rate tracking.

**B80-10032**

**VOLTAGE CONTROLLER/CURRENT LIMITER FOR AC**

T. T. WU (Caltech)

Aug. 1980

**NPO-13061**

Vol. 5, No. 1, p. 22

Circuit protects ac power systems for overload failures, limits power surge and short-circuit currents to 150 percent of steady state level, regulates ac output voltage, and soft starts loads. Limiter generates dc error signal in response to line fluctuations and dumps power when overload is reached. Device is inserted between ac source and load.

**B80-10033**

**MICROPROCESSOR CONTROL FOR PHASE-LOCK RECEIVER**

L. M. CARSON (Motorola, Inc.) and J. R. SHANER (Motorola, Inc.)

Aug. 1980

**NPO-14438**

Vol. 5, No. 1, p. 23

Subsystem facilitates flexible data acquisition by combining hardware and software processing. Device controls complex signal acquisition sequence and assists in precise phase locking to received signal. Key features include software system and code-generator initialization routines, executive routines, utility subroutines, control sequence routines for each receiver acquisition state, control-command decoding routine, and look-up tables for code-generator configuration versus code-set number. Steps can be added to extend input signal dynamic range.

**B80-10034**

**IMPROVED CODE-TRACKING LOOP**

D. T. LAFLAME (Hughes Aircraft Co.)

Aug. 1980

**MSC-18035**

Vol. 5, No. 1, p. 24

Delay-locked loop tracks pseudonoise codes without introducing dc timing errors, because it is not sensitive to gain imbalance between signal processing arms. 'Early' and 'late' reference codes pass in combined form through both arms, and each arm acts on both codes. Circuit accommodates 1 dB weaker input signals with tracking ability equal to that of tau-dither loops.

**B80-10035**

**MULTIPATH STAR SWITCH CONTROLLER**

T. O. ANDERSON (Caltech)

Aug. 1980

**NPO-13422**

Vol. 5, No. 1, p. 25

Device concept permits parallel computers to scan several common network-connected data stations at maximum rate. Sequencers leap-frog to bypass ports already being serviced by another computer. Two-path system for 16-port star switch controller is cost effective if added bandwidth or increased reliability is desired. Triple-path system would be cost effective for 32-port controller.

**B80-10036**

**MICROPROCESSOR-BASED DETECTOR FOR PSK COMMANDS**

J. DURDEN (Motorola, Inc.) and S. W. KLARE (Motorola, Inc.)

Aug. 1980

**NPO-14440**

Vol. 5, No. 1, p. 26

Command detector unit operates over wide range of data rates and signal levels in space environment. It consists of signal conditioning, read-only memory, random-access memory, and digital processor. Entire unit fits on single multilayer printed-wiring board.

**B80-10037**

**ONLINE ASSESSMENT OF A DISTRIBUTED PROCESSOR**

L. F. EHRLICH (IBM Corp.)

Aug. 1980

**KSC-11124**

Vol. 5, No. 1, p. 27

ORT (Operational Readiness Test) software allows one engineer to test readiness of 64 minicomputers and their peripherals from single console. Software makes roll call of computers and peripherals via common data buffer to check readiness of system in morning 'wake up' or at other important times. Subsystems are tested in parallel to save time. 'Watchdog' terminates test of any system that does not respond in time, so one failed system does not halt test sequence. Entire rollcall is complete in about 15 minutes. Software is designed for Space Shuttle prelaunch checkout, but approach should interest users of similar equipment.

**B80-10164**

**RAM-BASED FRAME SYNCHRONIZER**

J. K. NISWANDER and R. J. STATTEL

Sep. 1980

**GSFC-12430**

Vol. 5, No. 2, p. 149

Frame synchronizer for serial telemetry is rapidly reconfigured for changing formats. Synchronizer generates signals marking data-word boundaries, beginning of each frame, and beginning of each paragraph. Also derived are search, check, and lock status signals. Existing unit is assembled from standard random-access memory elements and MOS and low-power-Schottky logic.

**B80-10165**

**RAM-BASED PARALLEL-OUTPUT CONTROLLER**

J. K. NISWANDER and R. J. STATTEL

Sep. 1980

**GSFC-12447**

Vol. 5, No. 2, p. 150

Selected bit strings in serial-data link are extracted for processing. Controller is programmable interface between serial-data link and peripherals that accept parallel data. It can be used to drive displays, printers, plotters, digital-to-analog converters, and parallel-output ports.

**B80-10166**

**MICROCOMPUTER-BASED DOPPLER SYSTEMS FOR WEATHER MONITORING**

P. E. SCHMID and J. J. LYNN (Old Dominion Systems, Inc.)

Sep. 1980

**GSFC-12448**

Vol. 5, No. 2, p. 151

Ground-based microcomputer determines geographical positions of beacons using Doppler data from weather satellites. System requires only 7 W and incorporates least-squares iteration to compute positions. Results are printed out in alphanumeric either on CRT or on teletype. 6502 CPU was used, although equivalent processor could be substituted (with appropriate modifications to hardware).

**B80-10167**  
**LINEARIZING MAGNETIC-AMPLIFIER DC TRANSDUCER OUTPUT**

S. NAGANO (Caltech)  
 Sep. 1980

**NPO-14617** Vol. 5, No. 2, p 152

Diode corrects nonlinearity at small currents in magnetic-amplifier dc transducer circuit.

**B80-10168**  
**BETTER-QUALITY CCD-ARRAY IMAGES**

S. D. GAALEMA (Caltech)  
 Sep. 1980

**NPO-14426** Vol. 5, No. 2, p 153

In quadruple sampling, signal from each element in array is sampled once before element is clamped on, twice during 'on' period, once again after element is turned off. Quadruple-sampling scheme increases overall signal-to-noise by about 40 percent above level for double sampling, prediction verified by measurements on star-tracking imager.

**B80-10169**  
**REAL-TIME FILM RECORDING FROM STROKE-WRITTEN CRT'S**

R. HUNT and A. J. GRUNWALD (National Research Council)  
 Sep. 1980

**LANGLEY-12529** Vol. 5, No. 2, p. 154

Real-time simulation studies often require motion-picture recording of events directly from stroke written cathode-ray tubes (CRT's). Difficulty presented is prevention of 'flicker,' which results from lack of synchronization between display sequence on CRT and shutter motion of camera. Programmable method has been devised for phasing display sequence to shutter motion, ensuring flicker-free recordings.

**B80-10170**  
**TORQUE CONTROL FOR ELECTRIC MOTORS**

C. A. BERNARD (RCA Corp.)  
 Sep. 1980

**MSC-18635** Vol. 5, No. 2, p. 155

Method for adjusting electric-motor torque output to accommodate various loads utilizes phase-lock loop to control relay connected to starting circuit. As load is imposed, motor slows down, and phase lock is lost. Phase-lock signal triggers relay to power starting coil and generate additional torque. Once phase lock is recovered, relay restores starting circuit to its normal operating mode.

**B80-10171**  
**FREQUENCY-CONTROLLED VOLTAGE REGULATOR**

W. T. MCLYMAN (Caltech)  
 Sep. 1980

**NPO-13635** Vol. 5, No. 2, p. 156

Converting input ac to higher frequency reduce size and weight and makes possible unique kind of regulation. Since conversion frequency is above range of human hearing, supply generated on audible noise. It also exploits high-frequency conversion features to regulate its output voltage in novel way. Circuit is inherently short-circuit proof.

**B80-10172**  
**A REDUNDANT REGULATOR CONTROL WITH LOW STANDBY LOSSES**

R. W. ANDRYCZYK (GE) and S. R. PECK (GE)  
 Sep. 1980

**NPO-13165** Vol. 5, No. 2, p. 157

Shunt regulator circuit for outer-planet-spacecraft radioisotope thermoelectric generator minimizes power-conditioning losses. Unit consists of bank of duplicate regulator control amplifiers and their associated shunt transistors connected across power supply line. Its high-gain circuitry arranged in redundant configuration in very reliable and is characterized by low standby loss. Circuit can be used on other power-supply applications where size, weight, and reliability are important.

**B80-10173**  
**FREQUENCY RESPONSE FO MULTIPLE-SAMPLING RATE SYSTEMS**

D. K. SCHARMACK (Honeywell, Inc.)  
 Sep. 1980

**MSC-18473** Vol. 5, No. 2, p. 158

Analytical procedure simplifies prediction of frequency response of multirate digital control systems. Although developed for Space Shuttle flightcontrol system, procedure is applicable to any multirate system describable by linear, constant-coefficient differential equations of difference equations.

**B80-10303**  
**COMMON DATA BUFFER**

F. BYRNE  
 Jan. 1981

**KSC-11048** Vol. 5, No. 3, p. 277

Time-shared interface speeds data processing in distributed computer network. Two-level high-speed scanning approach routes information to buffer, portion of which is reserved for series of 'first-in, first-out' memory stacks. Buffer address structure and memory are protected from noise or failed components by error correcting code. System is applicable to any computer or processing language.

**B80-10304**  
**SIMULTANEOUS DISK STORAGE AND RETRIEVAL**

F. E. LEVINE (IBM)  
 Jan. 1981

**KSC-11167** Vol. 5, No. 3, p. 278

Data are concurrently recorded on disk by one minicomputer and accessed by another, using format of memory blocks, buffering algorithm, and time-sequence addressing. Buffering algorithm works at data rates up to 68,000 words per second; modifications up rate to 160,000 words per second.

**B80-10305**  
**FOUR-QUADRANT CCD ANALOG MULTIPLIER**

C. W. BROOKS (Westinghouse Electric Corp.) and D. R. LAMPE (Westinghouse Electric Corp.)

Jan. 1981 See also NASA-CR-145334(N79-14796)

**LANGLEY-12332** Vol. 5, No. 3, p. 279

Sequential processing technique improves accuracy when CCD-array signals are multiplied by weighting function to remove offsets. System uses two schemes to cancel undesired output contributions arising from prerequisite biases. First is spontaneous cancellation by multiple 'nominally identical' devices; second is sequential cancellation where same devices are used repeatedly to form multiple products. Single device then successively subtracts products, eliminating effects of MOS-array threshold nonuniformities.

**B80-10306**  
**MONOLITHIC FOUR-QUADRANT MULTIPLIER**

D. R. LAMPE (Westinghouse Electric Corp.)

Jan. 1981 See also NASA-CR-145334(N79-14796)

**LANGLEY-12330A** Vol. 5, No. 3, p. 280

Integrated configuration for 'differential' sequential processor is less susceptible to noise than one using discrete components. Accuracy of version is unaffected by sample-and-hold (S/H) acquisition speed, S/H droop rate, and stray pickup by separate card-mounted parts.

**B80-10307**  
**MONOLITHIC CCD-ARRAY READOUT**

D. L. FARNSWORTH (Westinghouse Electric Corp.), D. R. LAMPE (Westinghouse Electric Corp.), and T. J. SHUTT (Westinghouse Electric Corp.)

Jan. 1981 See also NASA-CR-145334(N79-14796)

**LANGLEY-12376** Vol. 5, No. 3, p. 282

Circuit is self-biasing, with differential current-to-voltage conversion. CMOS current-differencing readout consists of dc-balanced pair of virtual ground stages and current-differencing circuit similar to circuit mirror. Triode multiplier cell replaces test sources to form monolithic configuration. Transistors belonging to selected multiplier cell need to be duplicated for each multiplier

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within correlator chip. Remaining elements form part of readout and may be scaled as single common readout stage.

### B80-10308

#### RECEIVER ARRAY FOR HIGH-RATE TELEMETRY

M. H. BROCKMAN (Caltech) and M. F. EASTERLING (Caltech)  
Jan. 1981 See also B80-10309

NPO-14579

Vol. 5, No. 3, p. 284

RF carrier uses two receiver systems to increase signal-to-noise ratio and sensitivity. Signals separately processed are coherently combined at summing junction for improved reception of marginal high-rate signals frequently lost to system, atmosphere, and galactic noises. Two receivers improve ratio by 2.7 dB; improvement is made by arraying more receiver systems.

### B80-10309

#### ARRAYED RECEIVERS FOR LOW-RATE TELEMETRY

M. H. BROCKMAN (Caltech) and M. F. EASTERLING (Caltech)  
Jan. 1981 See also B80-10308

NPO-14590

Vol. 5, No. 3, p. 285

RF carrier array includes one master and slave receiving system to improve overall signal-to-noise ratio. Greater number of slave systems creates additional improvement. Scheme reduces detection threshold of low-rate telemetry signals transmitted from spacecraft, enhancing communications efficiency.

### B80-10310

#### COMPRESSING TV-IMAGE DATA

E. E. HILBERT (Caltech), J. LEE (Caltech), R. F. RICE (Caltech), and A. P. SCHLUTSMAYER (Caltech)  
Jan. 1981

NPO-14823

Vol. 5, No. 3, p. 286

Compressing technique calculates activity estimator for each segment of image line. Estimator is used in conjunction with allowable bits per line,  $N$ , to determine number of bits necessary to code each segment and which segments can tolerate truncation. Preprocessed line data are then passed to adaptive variable-length coder, which selects optimum transmission code. Method increases capacity of broadcast and cable television transmissions and helps reduce size of storage medium for video and digital audio recordings.

### B80-10311

#### REAL-TIME IMAGE ENHANCEMENT

V. S. WONG (Caltech)

Jan. 1981

NPO-14281

Vol. 5, No. 3, p. 287

Pipelined system with 'vision' algorithm is implemented on LSI chip that processes input digital image data to produce image-edge map. System contains 3 input adder, difference and absolute value cells, and adder and comparator. Data store for 1 to 2 ms, and are easily transmitted or isolated; design has reduced package count and number of interconnections for increased reliability. Applications include locating objects on moving belt, deep-sea and coal mining, and control of robotic rovers.

### B80-10312

#### TOGGLED SIGNAL FOR PREVENTION OF CONTROL ERRORS

C. E. WYLLIE (Honeywell, Inc.)

Jan. 1981

MSC-18779

Vol. 5, No. 3, p. 288

Redundant command lines use two different 'true' signals to avoid common failure modes. When function is required to operate, computer generates command and transmits it to demultiplexer, where it is split along two paths, producing outputs from separate electronic cards. Outputs combine to drive and gate high and begin function.

### B80-10313

#### CONVERTING A DIGITAL FILTER TO ITS ANALOG EQUIVALENT

J. F. L. LEE (Honeywell, Inc.)

Jan. 1981

MSC-18587

Vol. 5, No. 3, p. 289

Two complementary methods for conversion are direct conversion method and inverse of Tustin's method. Required accuracy of filter is achieved using best-matched technique. Both require only direct computations and are simpler and more efficient than conventional iterative systems or methods requiring 'ad hoc' filter parameter adjustment.

### B80-10314

#### AIRBORNE METEOROLOGICAL DATA-COLLECTION SYSTEM

J. W. BAGWELL and B. G. LINDOW

Jan. 1981 See also NASA-TM-78992(N78-33283)

LEWIS-13346

Vol. 5, No. 3, p. 290

Aircraft position and weather data are collected, formatted, and relayed to ground from in-flight commercial jets. Data Acquisition and Control Unit in plane receives information from standard avionics data units, and provides scaling and storage. Normally, eight sets of data are acquired in 1 hour period and transmitted to satellite at precise time. Besides meteorological applications, system can locate and reroute aircraft into favorable winds to conserve fuel or aid search for downed planes.

### B80-10315

#### RECEIVING SIGNALS OF ANY POLARIZATION

J. E. OHLSON (Caltech), B. L. SEIDEL (Caltech), and C. H. STELZRIED (Caltech)

Jan. 1981 See also B80-10297

NPO-14836

Vol. 5, No. 3, p. 291

Two-channel detection accommodates linear, circular, and elliptical polarization in one receiving unit. Receiver employs orthomode transducer which breaks any type signal into one left and one right circular component. These are processed in separate receiver channels with equal time-delay, and then recombined for data extraction. System eliminates losses due to polarization mismatch.

### B80-10316

#### PORTABLE ZERO-DELAY ASSEMBLY

M. M. FRANCO (Caltech), T. Y. OTOSHI (Caltech), and E. J. SERHAL, JR. (Caltech)

Jan. 1981

NPO-14671

Vol. 5, No. 3, p. 292

Instrument is calibrated using back-to-back method. In comparison standard, S-X isolators are opposite from device being tested to permit signal flow in reverse direction. After calibration portable zero-delay assembly (PZDA) is used to set time delays of deep-space network ground-station ranging systems. Approach is also used to calibrate microwave links in other communications systems.

### B80-10317

#### PHOTOMETER USED FOR RESPONSE TIME MEASUREMENT

A. J. DA SILVA

Jan. 1981

MSC-18712

Vol. 5, No. 3, p. 293

Photometer detects motion for measuring response speed and acceleration of servocontrol system. Instrument senses selected output movement shortly after operator activates hand-controlled input. Time delay is measured on X/T recorder and response calculated. With suitable motion targets, photometer measures any open- or closed-loop servoresponse and servorate or computer lag without system disturbance.

### B80-10446

#### SUPERCONDUCTING GYROCON WOULD BE VERY EFFICIENT

H. C. YEN (Caltech)

Apr. 1981

NPO-14975

Vol. 5, No. 4, p. 419

Cryogenic operation of gyrocon increases gain by more than 35 dB and efficiency by 90 percent. Device consists of electron gun, deflection cavity, output cavity, collector, and output coupler. Input and output cavities are made of superconducting lead or niobium. Gyrocon operates at frequencies up to 50 GHz.

**B80-10447****HIGH-POWER DUAL-DIRECTIONAL COUPLER**

T. Y. OTOSHI (Caltech) and K. B. WALLACE (Caltech)

Apr. 1981

**NPO-14713****Vol. 5, No. 4, p. 420**

Water-cooled coupler installed in S-band polarization diversity (SPD) cone is used to calibrate receiving-station relay. Coupler operates without arcing at 400 kw and permits accurate calibration of entire system below antenna feed horn. Device has good directivity, contributes less than 0.01 K to system noise temperature, and eliminates saturation of ground station and spacecraft receivers during high-power operation.

**B80-10448****CAVITY-BACKED SPIRAL-SLOT ANTENNA**

H. ELLIS, JR. (Rockwell International Corp.)

Apr. 1981

**MSC-18532****Vol. 5, No. 4, p. 421**

Compact, rugged, flush-mounted antenna operates in sum or difference modes with circular polarization. Radiating elements consist of two pairs of centerfed, interleaved spiral slots in conductive aperture plane. At center feedpoint of each slot pair is balanced feed assembly. Center points are fed from split-tube coaxial balun passing through quarter-wave length deep cavity. Circularly polarized patterns represent both received and transmitted signals.

**B80-10449****TIMING SIGNAL PROPAGATES WITHOUT PHASE SHIFT**

A. V. KANTAK (LinCom Corp.) and W. C. LINDSEY (LinCom Corp.)

Apr. 1981

**MSC-18777****Vol. 5, No. 4, p. 422**

Continuous monitoring of transmission delay corrects for phase shift. Nodes in Master/Slave Returnable Timing System (MSRTS) are arranged in hierarchy, with each node serving as master to several slave nodes. As signal at each slave is synchronized with original master, it serves as master to synchronize following slave nodes. System improves performance of phased microwave antenna arrays in solar-powered satellites and clock distribution systems in avionics and computers.

**B80-10450****TRISLOT-CAVITY MICROSTRIP ANTENNA**

H. ELLIS, JR. (Rockwell International Corp.)

Apr. 1981

**MSC-18793****Vol. 5, No. 4, p. 422**

Flush-mountable assembly composed of disk radiator sandwiched between planes of metal-clad dielectric board has greater bandwidths and beamwidths than simple disk antenna. Conducting planes connect so that disk is enclosed in cavity with Y-shaped slot in top plane. Cavity is excited by microwave energy from disk and radiates from trislot aperture.

**B80-10451****DEVELOPING EXPERIMENT INSTRUMENT PACKAGES**

R. HERREID

Apr. 1981

**GSFC-12536****Vol. 5, No. 4, p. 423**

Ground-Support Equipment (GSE) system supports development, calibration, and testing of experiment packages. It is also used for 'quick look' processing and in-progress data analysis. User interacts with incoming telemetry data, performs computations, and controls execution of procedures using versatile Experiment Command Interactive Language (ECIL). Program is implemented many ways with minimal modification. It is written in MARCO II and FORTRAN for DEC PDP-11/34 using the RSX-11M operating system.

A. B. ELLIS (MIT), S. W. KAISER (MIT), and M. S. WRIGHTON (MIT)

Aug. 1980

**LANGLEY-12591****Vol. 5, No. 1, p. 31**

Improved electrolytic cells have efficiencies comparable to those of best silicon solar cells but are potentially less expensive to manufacture. Cells consist of light-sensitive n-type semiconductor anode and metallic cathode immersed in electrolytic solution. Reversible redox cells produce no chemical change in electrolyte and stabilize anode against dissolving. Cell can produce more than 500 mW of power per square centimeter of anode area at output voltage of 0.4 V.

**B80-10039****NEW MOUNTING IMPROVES SOLAR-CELL EFFICIENCY**

N. F. SHEPARD, JR. (General Electric Co.)

Aug. 1980

**NPO-14467****Vol. 5, No. 1, p. 32**

Method boosts output by about 20 percent by trapping and redirecting solar radiation without increasing module depth. Mounted solar-cell array is covered with internally reflecting plate. Plate is attached to each cell by transparent adhesive, and space between cells is covered with layer of diffusely reflecting material. Solar energy falling on space between cells is diffused and reflected internally by plate until it is reflected onto solar cell.

**B80-10040****ENERGY-SAVING THERMOSTAT**

R. N. JENSEN

Aug. 1980

**LANGLEY-12450****Vol. 5, No. 1, p. 33**

Thermostat for two-stage heating system adjusts turn-on time and thermostat setpoint so that reserve resistance electrical heaters are not activated in morning warm up. Thermostat monitors outside temperature and turns on heat earlier in cold weather so that room will be at desired temperature by specified time. Mechanical, electrical, electronic, pneumatic, or microprocessor versions of device are possible. Correctional factors can be included where second-stage operation is more cost-effective than prolonged first-stage operation.

**B80-10041****ROTATABLE PRISM FOR PAN AND TILT**

W. B. BALL

Aug. 1980

**LANGLEY-12388****Vol. 5, No. 1, p. 34**

Compact, inexpensive, motor-driven prisms change field of view of TV camera. Camera and prism rotate about lens axis to produce pan effect. Rotating prism around axis parallel to lens produces tilt. Size of drive unit and required clearance are little more than size of camera.

**B80-10042****ULTRAVIOLET SPECTROMETER/POLARIMETER**

Innovator not given (Brown Engineering of Teledyne Industries, Inc.) Aug. 1980

**M-FS-25298****Vol. 5, No. 1, p. 34**

Improved satellite instrument package consists of telescope, spectrometer with polarimeter, five detectors, and control electronics. Instrument is designed to study solar ultraviolet radiation. Polarimeter will determine four Stokes parameters and possible mechanisms for producing linear and circular polarization. Density measurements of Earth's upper atmosphere constituents are possible.

**B80-10043****AN ADJUSTABLE SOLAR CONCENTRATOR**

E. R. COLLINS, JR. (Caltech)

Aug. 1980

**NPO-14710****Vol. 5, No. 1, p. 35**

Fixed cylindrical converging lenses followed by movable parabolic mirror focus solar energy on conventional linear collector.

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**B80-10038****PHOTOELECTROCHEMICAL CELL WITH NONDISSOLVING ANODE**



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System is low cost and accommodates daily and seasonal movements of the sun. Mirrors may be moved using simple, low-power electrical motors.

#### B80-10044

##### LARGE-VOLUME MULTIPLE-PATH NUCLEAR-PUMPED LASER

F. HOHL and R. J. DE YOUNG (Miami Univ.)

Aug. 1980

LANGLEY-12592

Vol. 5, No. 1, p. 36

Output of nuclear pumped laser is increased using mirrors, so multiple optical reflections enlarge lasing-mode volume. Design requires comparatively low thermal neutron flux, uses flux more efficiently. Flux for lasing approaches that available from steady-state reactor. Outputs over 100 watts have been reached.

#### B80-10045

##### EXTRACTING ENERGY FROM NATURAL FLOW

L. M. DELIONBACK and G. A. WILHOLD

Aug. 1980

M-FS-23989

Vol. 5, No. 1, p. 37

Three concepts for extracting energy from wind, waterflow, and tides utilize flow instability to generate usable energy. Proposed converters respond to vortex excitation motion, galloping or plunging motion, and flutter. Fluid-flow instability is more efficient in developing lift than is direct flow.

#### B80-10046

##### TWELVE SOLAR-HEATING/COOLING SYSTEMS: DESIGN AND DEVELOPMENT

Innovator not given (Energy Resources Center of Honeywell, Inc.) Aug. 1980

M-FS-25358

Vol. 5, No. 1, p. 38

Two quarterly reports describe first 6 months of development on single family, multifamily, and commercial installations in Minneapolis area. Reports discuss basic requirements, and reasons for selecting specific configurations. Systems consist of liquid cooled flat plate collectors, two fluid loops, and gas-fired forced-air auxiliary heat source.

#### B80-10047

##### SOLAR-HEATING AND COOLING SYSTEM DESIGN PACKAGE

Innovator not given (Solaron Corp.) Aug. 1980

M-FS-25393

Vol. 5, No. 1, p. 38

Package of information includes design data, performance specifications, drawings, hazard analysis, and spare parts list for commercially produced system installed in single-family dwelling in Akron, Ohio. System uses air flat-plate collectors, 12000 kg rock storage and backup heat pump. Solar portion requires 0.7 kW, and provides 35% of average total heating load including hot water. Information aids persons considering installing solar home-heating systems.

#### B80-10048

##### BENEFIT ASSESSMENT OF SOLAR-AUGMENTED NATURAL GAS SYSTEMS

E. S. DAVIS (Caltech), R. L. FRENCH (Caltech), and R. L. SOHN (Caltech)

Aug. 1980

NPO-14568

Vol. 5, No. 1, p. 38

Report details how solar-energy-augmented system can reduce natural gas consumption by 40% to 70%. Applications discussed include: domestic hot water system, solar-assisted gas heat pumps, direct heating from storage tank. Industrial uses, solar-assisted appliances, and economic factors are discussed.

#### B80-10049

##### AIR-COOLED SOLAR-COLLECTOR SPECIFICATION

Innovator not given (Owens-Illinois, Inc.) Aug. 1980

M-FS-25336

Vol. 5, No. 1, p. 39

Report summarizes performance specifications of 72-element, concentric-tube collector. Chart shows minimum collector efficiency as function of operating conditions.

#### B80-10050

##### INDOOR TESTS OF THE CONCENTRIC-TUBE SOLAR COLLECTOR

Innovator not given (Solar Energy Systems Division of Wyle Laboratories) Aug. 1980

M-FS-25390

Vol. 5, No. 1, p. 39

Report describes performance tests on 12-tube, liquid-filled collector. Thermal efficiency, change in efficiency with sun position, and time constant for temperature drop after solar flux is cut are described.

#### B80-10051

##### EVACUATED-TUBE SOLAR COLLECTOR-PERFORMANCE EVALUATION

Innovator not given (Wyle Laboratories) Aug. 1980

M-FS-25339

Vol. 5, No. 1, p. 39

Report gives thermal performance test procedures and results for commercially produced, water-filled, 8-tube collectors. Tests include efficiency, time constant for temperature drop after solar flux is cut, change in efficiency as function of sun angle, and test to see if tubes break when filled with hot water.

#### B80-10052

##### GLYCOL/WATER EVACUATED-TUBE SOLAR COLLECTOR

Innovator not given (Wyle Laboratories) Aug. 1980

M-FS-25337

Vol. 5, No. 1, p. 40

Report describes performance of 8 tube and 10 tube commercially produced solar collectors. Tests include thermal efficiency, time constant for temperature drop after solar flux is cut, change in efficiency with Sun angle, and temperature rise if circulation is stopped.

#### B80-10053

##### THERMOSYPHON HEAT EXCHANGER

J. D. HANKINS

Aug. 1980

M-FS-25389

Vol. 5, No. 1, p. 40

Report summarizes final development, testing, and certification of pumpless, liquid-to-air heat exchanger for solar heating. System requires blower but no pump in water loop. Output is 35,000 Btu/hr when water temperature is 49 C.

#### B80-10054

##### CONTROLLER FOR SOLAR-ENERGY SYSTEMS

J. D. HANKINS

Aug. 1980

M-FS-25386

Vol. 5, No. 1, p. 40

Report describes operation and testing of computerized control unit for solar-heating and cooling systems. Unit includes electronics and 'plumbing'. Components are modular. Microprocessor with ROM and RAM operates fans, pumps, and valves, and retains selected data for 32 hours.

#### B80-10055

##### CONTROLLER AND TEMPERATURE MONITOR FOR SOLAR HEATING

J. D. HANKINS

Aug. 1980

M-FS-25387

Vol. 5, No. 1, p. 41

Report describes development and certification of 77-171 differential thermostat for controlling solar-heating and cooling systems and 77-180 temperature monitor of indoor, outdoor, and storage temperatures. Units are commercially available.

#### B80-10056

##### INHIBITING CORROSION IN SOLAR-HEATING AND COOLING SYSTEMS

G. E. DERAMUS, JR. and T. S. HUMPHRIES

Aug. 1980

M-FS-25387

Vol. 5, No. 1, p. 41

Report describes evaluation of 12 water additives in contact with aluminum, copper, steel, and stainless steel at 80 C for one year. Several promising formulations were found.

#### B80-10057

##### NUMERICAL TRACING OF ELECTRON TRAJECTORIES

T. N. DELMER (Science Applications, Inc.) and T. C. STEPHENS  
Aug. 1980

**GSFC-12535**

**Vol. 5, No. 1, p. 41**

Computer program integrates path of relativistic electron through region of nonuniform static electromagnetic fields with accuracy of 1 micrometer in 10 centimeters. Program can be used to evaluate and modify design of electron-imaging systems. Language is FORTRAN IV, for batch or interactive execution on PDP 10, 11, CYBER 70, 170, and CDC 6000.

**880-10058**

#### **NASA CHARGING ANALYZER PROGRAM**

J. J. CASSIDY, III (Systems, Science & Software), J. M. HARVEY (Systems, Science & Software), I. KATZ (Systems, Science & Software), and M. J. MANDELL (Systems, Science & Software)  
Aug. 1980

**LEWIS-12973**

**Vol. 5, No. 1, p. 42**

Computer program predicts electrostatic charging of three dimensional, conducting object partially or completely covered with dielectric films. Program is useful in describing spacecraft charging and material accumulation in plasma environment of magnetosphere. Numerous graphic outputs are implemented. Language is FORTRAN V, for batch execution on 1100-series computer.

**880-10174**

#### **AN EQUATION OF STATE FOR LIQUIDS**

R. F. FEDORS (Caltech), R. F. LANDEL (Caltech), and J. MOACANIN (Caltech)

Sep. 1980

**NPO-14821**

**Vol. 5, No. 2, p. 161**

Closed expression for volume as function of pressure and temperature has been verified for over 250 liquids. Equation can assist chemical engineers, solid-state researchers, and others with interest in thermodynamic behavior of liquids.

**880-10175**

#### **HIGH-RESOLUTION SPECTROMETRY/INTERFEROMETER**

J. B. BRECKINRIDGE (Caltech), R. H. NORTON (Caltech), and R. A. SCHINDLER (Caltech)

Sep. 1980

**NPO-14448**

**Vol. 5, No. 2, p. 162**

Modified double-pass interferometer has several features that maximize its resolution. Proposed for rocket-borne probes of upper atmosphere, it includes cat's-eye retroreflectors in both arms, wedge-shaped beam splitter, and wedged optical-path compensator. Advantages are full tilt compensation, minimal spectrum 'channeling,' easy tunability, maximum fringe contrast, and even two-sided interferograms.

**880-10176**

#### **INSTRUMENT REMOTELY MEASURES WIND VELOCITIES**

J. S. MARGOLIS (Caltech), D. J. MCCLEESE (Caltech), C. H. SEAMAN (Caltech), and M. S. SHUMATE (Caltech)

Sep. 1980

**NPO-14524**

**Vol. 5, No. 2, p. 163**

Doppler-shift spectrometer makes remote satellite measurements of atmospheric wind velocity and temperature at specified altitudes. As in correlation spectrometer, spectrum of gas in reference cell and spectrum of same gas in atmosphere are correlated both in emission and absorption.

**880-10177**

#### **FAR-FIELD RADIATION PATTERN OF TUNABLE DIODE LASERS**

T. J. LASH

Sep. 1980

**LANGLEY-12631**

**Vol. 5, No. 2, p. 164**

Technique rapidly determines far-field spatial energy distribution. Method takes about 3 minutes. It is optically simple and is economical, using standard laboratory parts and equipment. It records automatically without operator control and is easily adaptable to computer control of input instructions and computer treatment of output data. Degree of data resolution is limited only by width of recorder pen, and data are repeatable.

**880-10178**

#### **OPTICAL CALIBRATOR FOR TDL SPECTROMETERS**

D. E. JENNINGS

Sep. 1980

**GSFC-12562**

**Vol. 5, No. 2, p. 164**

Two etalons and monochromator mode selector help calibrate spectrometer in selected laser mode. Technique accurately determines free spectral range of etalon. By establishing number of fringes between two modes, both of which have been calibrated with molecular line standards, one finds free spectral range with error inversely proportional to spectral interval between calibration points. Procedure establishes free spectral range of etalon without prior knowledge of its length or refractive index.

**880-10179**

#### **UV ACTINOMETER FILM**

C. D. COULBERT (Caltech), A. GUPTA (Caltech), and J. PITTS (California Univ., Riverside)

Sep. 1980

**NPO-14479**

**Vol. 5, No. 2, p. 165**

Cumulative UV radiation can be measured by low-cost polymer film that is unaffected by visible light. Useful for virtually any surface, film can help paint and plastics manufacturers determine how well their products stand up against UV radiation. Actinometer film uses photochemically sensitive compound that changes its chemical composition in response to solar radiation. Extent of chemical conversion depends on length exposure and can be measured by examining film sample with spectrophotometer. Film can be exposed from several seconds up to month.

**880-10180**

#### **FLUORESCENT RADIATION CONVERTER**

W. VIEHMANN

Sep. 1980

**GSFC-12528**

**Vol. 5, No. 2, p. 166**

Fluorescent radiation converter used optically transparent substrate. One side of substrate is coated with plastic film containing fluorescent organic dyes that absorb optical radiation at one wavelength and emit it at longer one. Coating is formulated to respond to specific wavelengths. Emitted radiation is reflected internally inside substrate, amplifying intensity that reaches radiation detector. Converter can be made in several shapes and size; round and square bars coated all round their lengths are useful in converting relatively intense radiation and transmitting it through substrate over lengthy distances.

**880-10181**

#### **AUTOMATED HOLOGRAPHIC DROP-SIZE ANALYZER RPN**

**NPO-14676**

S. P. FEINSTEIN (Caltech) and M. A. GIRARD (Caltech)

Sep. 1980

**Vol. 5, No. 2, p. 166**

System analyzes drop-size distribution in liquid-droplet-spray combustion fields. Holographic camera takes 'stop-motion' hologram of combustion volume; it is then viewed by vidicon camera connected to digital data-processing system that identifies particles or droplets, determining their size and count, and displays histogram of drop-size distribution in holographic field.

**880-10182**

#### **PHOTOGRAPHIC MEASUREMENT OF DROPLET DENSITY**

W. C. YAGER (GE)

Sep. 1980

**M-FS-25326**

**Vol. 5, No. 2, p. 167**

Density of cloud droplets in expansion chamber or static diffusion liquid chamber is measured with error of less than 3 percent by improved photographic technique. Precision is substantial advance over 10 percent accuracy limitation in methods used in past. Method should be useful in pollutant analysis, fine-particle research, and aerosol studies.

**880-10183**

#### **CAMERA ADD-ON RECORDS TIME OF EXPOSURE**

E. C. COMPTON, P. C. KASSEL, JR., and C. W. KNIGHT

Sep. 1980

**LANGLEY-12635**

**Vol. 5, No. 2, p. 168**

Time photograph is taken and is permanently recorded on

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edge of exposure by compact electronics module that attaches to camera case. Single-chip timing circuit drives LED display, which is imaged on film plane. Normally blanked display is unblanked when shutter switch is activated.

**B80-10184**

#### **IMPROVED MULTISPECTRAL SOLAR CELL ARRAY**

J. J. REDMANN (The Aerospace Corp.)

Sep. 1980

**HQN-10937**

**Vol. 5, No. 2, p. 169**

Solar-collector system projects oval-shaped color-band images onto solar cells designed to be most efficient at specific wavelength. Image size can be altered by changing width of reflecting mirror of power of lens. Image intensity is thus kept at optimum level, preventing cells from overheating.

**B80-10185**

#### **LOW-COST CALIBRATION OF ACOUSTIC LOCATORS**

R. F. BERRY

Sep. 1980

**LANGLEY-12632**

**Vol. 5, No. 2, p. 169**

Method uses modified commercially-available piezoelectric torch lighter. Handheld lighter has controlled spark gap that can be easily adjusted to produce repeatable short-duration high-amplitude voltage spikes. Pulser and lighter are coupled via short axial cable, eliminating long cable run variations in cable attenuation, and problem with cable entangling with anything in its path.

**B80-10186**

#### **INTEGRAL STORAGE-BULB AND MICROWAVE CAVITY FOR MASERS**

V. S. REINHARDT

Sep. 1980

**GSFC-12542**

**Vol. 5, No. 2, p. 170**

Mechanically-stable integral storage-bulb/microwave cavity made out of single piece of fused quartz improves frequency stability. Single-piece construction eliminates joints, making cavity dimensionally and hence frequency-stable. Fused quartz is used because of its low thermal expansion coefficient.

**B80-10187**

#### **A SURVEY OF PHOTOVOLTAIC SYSTEMS**

Innovator not given (Alabama Univ.) Sep. 1980

**M-FS-25397**

**Vol. 5, No. 2, p. 171**

Results of extensive telephone survey of photovoltaic manufacturers are compiled in 220 page report. Three part report includes catalog of suppliers, data sheets on specific products, and typical operating, installation, and maintenance procedures.

**B80-10188**

#### **THERMAL STRATIFICATION IN LIQUID STORAGE TANKS**

D. L. CHRISTENSEN (Alabama Univ.) and S. M. HAN (Alabama Univ.)

Sep. 1980

**M-FS-25416**

**Vol. 5, No. 2, p. 171**

Comprehensive literature survey indicates thermal stratification in solar-energy/liquid-storage tank improves system performance by as much as 15 percent. Collector efficiency increases when collector inlet fluid is drawn from bottom of storage tank, where fluid is coolest; warmest liquid drawn top of tank to satisfy thermal load.

**B80-10189**

#### **FINAL REPORT ON DEVELOPMENT OF A PROGRAMMABLE CONTROLLER**

J. D. HANKINS

Sep. 1980 See also B78-10183

**M-FS-25388**

**Vol. 5, No. 2, p. 172**

Microprocessor-based controller for solar-heating and cooling systems is described in report. Analog data from flow sensors, temperature sensors, and other devices are accepted by programmable controller. It also receives digital input from relays and switches. Report describes background of development program. It also summarizes operation, performance, and applications of controller.

**B80-10190**

#### **FRESNEL LENS TRACKING SOLAR COLLECTOR**

Innovator not given (Solar Energy Systems Div. of Wyle Laboratories) Sep. 1980 See also B79-10061

**M-FS-25419**

**Vol. 5, No. 2, p. 172**

Commercial tracking collector that uses acrylic Fresnel lenses to focus Sunlight on copper absorber tubes was evaluated. Tests are documented in 16 page report.

**B80-10191**

#### **OUTDOOR TESTS OF THE CONCENTRIC-TUBE COLLECTOR**

Innovator not given (Wyle Laboratories) Sep. 1980 See also

**B80-10050**

**M-FS-25398**

**Vol. 5, No. 2, p. 172**

Seventy two element, air-filled version of concentric-tube solar collector recently underwent 2 month performance evaluation at Marshall Space Flight Center solar house. Summary of results, along with other relevant data, is presented in 27 page report.

**B80-10192**

#### **SELECTIVE OPTICAL COATINGS FOR SOLAR COLLECTORS**

J. R. LOWERY

Sep. 1980

**M-FS-23589**

**Vol. 5, No. 2, p. 173**

For best performance, energy-absorbing surface of solar collector should be characterized by high ratio of solar absorptance to thermal emittance. Report on optical characteristics of several chemical treatments and electrodeposited coatings for metal solar-absorbing surfaces should interest designers and users of solar-energy systems. Moisture resistance of some coatings is also reported.

**B80-10193**

#### **FINNED-ABSORBER SOLAR COLLECTOR**

Innovator not given (Solar Energy Systems Div. of Wyle Laboratories) Sep. 1980

**M-FS-25385**

**Vol. 5, No. 2, p. 173**

Report presents results of performance evaluation. Tests are part of continuing study of solar-heating systems and components for NASA and Department of Energy. Test data are presented as graphs and tables. Report also summarizes test procedures and mathematical analysis of results.

**B80-10194**

#### **A TEST PROGRAM FOR SOLAR COLLECTORS**

Innovator not given (Energy Resources Center of Honeywell, Inc.) Sep. 1980 See also B79-10059

**M-FS-25433**

**Vol. 5, No. 2, p. 173**

Rigorous environmental and performance tests qualify solar collector for use in residential solar-energy systems. Testing over 7 month period examined pressurized effects, wind and snow loading, hail damage, solar and thermal degradation, effects of pollutants, efficiency, and outgassing. Test procedures and results are summarized in tables, graphs, and text.

**B80-10195**

#### **OPERATIONAL TESTS OF A SOLAR-ENERGY SYSTEM IN GEORGIA**

Innovator not given (Federal Systems Div. of IBM Corp.) Sep. 1980

**M-FS-25420**

**Vol. 5, No. 2, p. 174**

Seventy three page report describes one year performance of commercial solar-energy hot-water system. Silicone oil is heat-exchange fluid in tested system, designed to meet needs of family of four. Roll-bend heat exchanger is wrapped around hot-water storage tank. Oil circulates through exchanger and flat-plate solar collectors. Auxiliary energy, to maintain temperature in storage tank, is supplied by 4,500-watt resistance-heating element.

**B80-10196**

#### **OPERATIONAL TESTS OF A SOLAR ENERGY SYSTEM FLORIDA SITE**

Innovator not given (Federal Systems Division of IBM Corp.) Sep. 1980

**M-FS-25423** Vol. 5, No. 2, p. 174  
System has been evaluated for performance at test site in Loxahatchee, Florida. Results of tests are available in 76 page report. Projected annual electrical energy savings are above 10 million Btu.

**B80-10197**  
**A SOLAR-ENERGY SYSTEM IN PENNSYLVANIA**  
Innovator not given (Energy Resources Center of Honeywell, Inc.) Sep. 1980

**M-FS-25427** Vol. 5, No. 2, p. 174  
Report describes development of solar-heating system for single-family residence at site in Pennsylvania. 143 page document, containing detailed drawings, performance specifications, cost tradeoff studies, and other material, can assist those planning similar systems in areas of similar climate.

**B80-10198**  
**INSTALLATION GUIDELINES FOR THE PENNSYLVANIA SYSTEM**

Innovator not given (Energy Resources Center of Honeywell, Inc.) Sep. 1980

**M-FS-25424** Vol. 5, No. 2, p. 175  
Installation of solar-energy system is documented in report. Included are procedures for filling and testing entire system, along with installation guidelines for each major subsystem.

**B80-10199**  
**A SOLAR-ENERGY SYSTEM IN MINNESOTA**  
Innovator not given (Energy Resources Center of Honeywell, Inc.) Sep. 1980

**M-FS-25428** Vol. 5, No. 2, p. 175  
Report discusses system for Minnesota residence. Final design was arrived at that will meet 45 percent of total average heating load and will supply 40 gallons of potable water at 140 F. Document contains detailed drawings, specifications, and cost tradeoff studies. Also included are outline of proposed installation, operation and maintenance manual, and analysis of hazards.

**B80-10200**  
**SOLAR-ENERGY SYSTEM EVALUATION-PENNSYLVANIA SITE**

Innovator not given (Federal Systems Division of IBM Corp.) Sep. 1980 See also B79-10336

**M-FS-25434** Vol. 5, No. 2, p. 175  
Solar-heating and hot-water system installed in single-family residence test program. Results of tests are available in 82 page report.

**B80-10201**  
**A HOT-WATER SYSTEM TESTED ONSITE--TOGUS, MAINE**  
Innovator not given (Federal Systems Division of IBM Corp.) Sep. 1980 See also B78-10334

**M-FS-25435** Vol. 5, No. 2, p. 175  
Performance close to design specifications was verified over one year study in solar hot-water system. Study looked at long-term operation of system installed in residential building in Togus, Maine.

**B80-10202**  
**A RELIABLE SOLAR-HEATING SYSTEM--HUNTSVILLE, ALABAMA**

Innovator not given (City of Huntsville) Sep. 1980

**M-FS-25431** Vol. 5, No. 2, p. 176  
Final report on solar-heating demonstration project in Huntsville, Alabama, is rich in technical data, planning considerations, test and maintenance data, and other information. It can be useful reference for those planning similar systems.

**B80-10203**  
**SOLAR-HEATING AND COOLING DEMONSTRATION PROJECT**

Innovator not given (Florida Solar Energy Center of the Univ. of Florida) Sep. 1980

**M-FS-25443** Vol. 5, No. 2, p. 176  
Florida Solar Energy Center has retrofitted office building,

approximately 5,000 square feet of area, with solar heating and air-conditioning. Information on operation, installation, controls, and hardware for system is contained in 164 page report. Document includes manufacturer's product literature and detailed drawings.

**B80-10318**  
**MULTIPEXED LOGIC CONTROLS SOLAR-HEATING SYSTEM**

J. R. CURRIE

Jan. 1981 See also B78-10182

**M-FS-25287** Vol. 5, No. 3, p. 297

Four inexpensive thermocouples monitor temperatures at key points. On command from logic circuitry, dampers open and close to direct airflow, and fan and auxiliary heater shut on or off. Controlling complex arranges heating system in any one of four operating configurations.

**B80-10319**  
**FOUR-CELL SOLAR TRACKER**

C. M. BERDAHL (Caltech)

Jan. 1981

**NPO-14811** Vol. 5, No. 3, p. 298

Forty cm Sun tracker, consisting of optical telescope and four solar cells, stays pointed at Sun throughout day for maximum energy collection. Each solar cell generates voltage proportional to part of solar image it receives; voltages drive servomotors that keep image centered. Mirrored portion of cylinder extends acquisition angle of device by reflecting Sun image back onto solar cells.

**B80-10320**  
**OFFSET PARABOLOIDAL SOLAR CONCENTRATOR**

E. Y. CHOW (Caltech)

Jan. 1981

**NPO-14846** Vol. 5, No. 3, p. 299

Section of conventional paraboloid, offset from its major axis, is used as reflector in solar concentrator. Design increases solar gathering efficiency by 3 to 4 percent by eliminating shadowing and blocking of solar rays. In addition, reflector can be folded toward receiver, reducing wind-loading and making maintenance easier.

**B80-10321**  
**MINIATURE PERSONAL UV SOLAR DOSIMETER**

R. R. ADAMS, I. O. MACCONOCHIE, and B. D. POOLE, JR.

Jan. 1981

**LANGLEY-12469** Vol. 5, No. 3, p. 300

Small light-powered meter measures accumulated radiation in ultraviolet or other selected regions. Practical advantages are device's low cost, small size, accuracy, and adaptability to specific wave-band measurements. Medical applications include detection of skin cancer, vitamin D production, and jaundice. Dosimeter also measures sunlight for solar energy designs, agriculture and meteorology, and monitors stability of materials and environmental and occupational lighting.

**B80-10322**  
**ECONOMICAL ULTRAVIOLET RADIOMETER**

C. H. SEAMAN (Caltech) and R. S. ESTEY (Kirk-Mayer, Inc.)

Jan. 1981

**NPO-14843** Vol. 5, No. 3, p. 301

Inexpensive, cosine-corrected radiometer measures ultraviolet radiation. In field use, instrument tests materials for effects of ultraviolet exposure and studies solar-cell degradation. It consists of cup-shaped diaphragm and diffusing dome for corrected response, two filters that select wavelength range, and silicon solar cell. Filters control response within passband of 300 to 400 nm.

**B80-10323**  
**PREDICTING AND MONITORING DUSTSTORMS**

P. M. WOICESHYN (Caltech)

Jan. 1981

**NPO-14277** Vol. 5, No. 3, p. 302

Information on duststorms is processed by terminal receiving



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signals from two geosynchronous satellites. Data are correlated with that of other agencies to produce color maps depicting storm area. Series of maps reveals storm direction, warning regions up to 24 hours before they are struck.

**B80-10324**  
**NOISE SUPPRESSION IN FORWARD-SCATTERING OPTICAL INSTRUMENTS**

J. M. FRANKE and L. R. GARTRELL  
Jan. 1981

**LANGLEY-12730** Vol. 5, No. 3, p. 303

Apertures and stops located at conjugate points in receiver optics reduce noise caused by scattered light. They are placed as real, inverse images of each other, so only light from sample volume reaches detector. Noise suppression technique increases signal-to-noise ratio on order of 15 dB.

**B80-10325**  
**ENERGY-REDUCTION CONCEPT FOR INCANDESCENT LAMPS**

K. H. VORHABEN (Lockheed Electronics Co.)  
Jan. 1981

**MSC-18757** Vol. 5, No. 3, p. 304

Reusable infrared reflector maintains filament temperature and reduces power requirements. Fixed installed over light bulb directs energy formerly lost back to lamp filament. This energy aids electric current in heating filament, allowing lower-wattage bulb to produce same amount of light as higher-wattage bulb in ordinary fixture.

**B80-10326**  
**ACOUSTICALLY-TUNED OPTICAL SPECTROMETER**

E. SKLAR (American Science and Engineering, Inc.)  
Jan. 1981

**HQN-10924** Vol. 5, No. 3, p. 304

Lens arrangement corrects for aberrations and gives resolution of 0.7 seconds of arc. In spectrometer, light from telescope is relayed by doublet lens to acoustically tuned optical filter. Selected wavelengths are relayed by triplet lens to charge coupled device camera. Intervening cylindrical lens, tilted at 12 degree angle, corrects for astigmatism and coma introduced by two element birefringent crystal in filter.

**B80-10327**  
**COMBINED PHOTOVOLTAIC AND THERMAL-STORAGE MODULE**

J. W. STULTZ (Caltech)  
Jan. 1981

**NPO-14591** Vol. 5, No. 3, p. 305

Module uses phase change heat absorbing wax to reduce peak temperatures, increasing electrical efficiency. Wax makes module more cost effective than conventional thermomodels by also storing thermal energy for air and water heating.

**B80-10328**  
**TRACKING FALLING OBJECTS**

R. E. FRAZER (Caltech)  
Jan. 1981

**NPO-14813** Vol. 5, No. 3, p. 306

Moving lens follows movement of object accelerated by gravity. Lenses and mirrors maintain constant magnification regardless of distance between moving optical carriage mechanism and fixed telescope. Device tracks objects up to 2 cm in diameter over vertical distance of 2 m.

**B80-10329**  
**DIPLEXER FOR LASER-BEAM HETERODYNE RECEIVER**

G. KOEPF (Phoenix Corp.)  
Jan. 1981

**GSFC-12589** Vol. 5, No. 3, p. 307

Four prism interferometer superposes local oscillator beam on signal beam. Position of movable prism directs incident energy in both beams out one output port. Output port is spatially separated from input ports, and there is no limitation on size of frequency difference between laser beams.

**B80-10330**  
**POWERFUL COPPER CHLORIDE LASER**

T. J. PIVROTTO (Caltech)  
Jan. 1981

**NPO-14782** Vol. 5, No. 3, p. 308

Two design innovations give up to thirtyfold increase in power in 300 W laser amplifier. Heat is removed by flowing lasing gas through system, allowing larger lasing volumes. Fast, uniform excitation discharges are obtained with transverse, rather than longitudinal, electrodes.

**B80-10331**  
**HEAT FOR FILM PROCESSING FROM SOLAR ENERGY**  
Innovator not given (Interactive Resources, Inc.) Jan. 1981 See also DOE/NASA-CR-161414 (N80-22781)

**M-FS-25444** Vol. 5, No. 3, p. 309

Report describes solar water heating system for laboratory in Mill Valley, California. System furnishes 59 percent of hot water requirements for photographic film processing. Text of report discusses system problems and modifications, analyzes performance and economics, and supplies drawings and operation/maintenance manual.

**B80-10332**  
**SOLAR HEATER/COOLER FOR MASS MARKET**

Innovator not given (Space Div. of GE) Jan. 1981 See also DOE/NASA-CR-161422 (N80-24746)

**M-FS-25452** Vol. 5, No. 3, p. 309

Report describes project to design, build, and test simple and affordable solar systems. Four combinations of heating, cooling, and domestic hot water supply systems were developed and installed. Test sites, plan for systems and components, and performance are discussed; text is complimented by detailed drawings and test data.

**B80-10333**  
**DATA-ACQUISITION AND CONTROL SYSTEM FOR SEVERE ENVIRONMENTS**

Innovator not given (Wyle Labs., Inc.) Jan. 1981 See also DOE/NASA-CR-161449 (N80-25783)

**M-FS-25471** Vol. 5, No. 3, p. 310

Report evaluates control system by measuring accuracy and performance of system subcomponents, including interface wiring unit, power controller, and tape recorder. Test parameters establish variety of severe operation environments. Text features test program descriptions, sample readouts, and results. Summary of custom solar system simulator is included.

**B80-10334**  
**SOLAR HEATER/COOLER FOR MASS MARKET**

Innovator not given (Lutz-Sotire Partnership) Jan. 1981 See also DOE/NASA/CR-161436 (N80-27800)

**M-FS-25468** Vol. 5, No. 3, p. 310

Electrical energy consumption is reduced by half for 2 1/2 story office building. 138 liquid flat plate solar collectors are mounted on building roof, which faces nearly due south. Final project report includes detailed drawings and photographs, operation and maintenance manual, acceptance test plan, and related information.

**B80-10335**  
**SOLAR-HEATED AND COOLED OFFICE BUILDING-- DALTON, GEORGIA**

Innovator not given (N. GA. Area Planning and Development Commission) Jan. 1981 See also DOE/NASA-CR-161273 (N80-11555)

**M-FS-25451** Vol. 5, No. 3, p. 310

Modern energy efficient building is heated and cooled by five rows of flat plate solar collectors; its domestic hot water needs are also met. Final report includes detailed drawings and photographs, manufacturer's literature, performance specifications, acceptance test data, and performance verification statements. Operation and maintenance manual is also attached.

**B80-10336**  
**SOLAR-HEATING AND HOT WATER SYSTEM--ST. LOUIS, MISSOURI**

Innovator not given (William Tao and Assoc.) Jan. 1981 See also DOE/NASA-CR-161420 (N80-24744)

**M-FS-25453** Vol. 5, No. 3, p. 311

Sunlight supplies about half heat energy needs of small office. System includes six tilt-adjustable commercial collectors and 1,000 gallon energy storage tank. Report contains description of system and components, drawings and photographs, manufacturer's data, and related material.

**B80-10337**

**SOLAR HEATING FOR AN ELECTRONICS MANUFACTURING PLANT--BLUE EARTH, MINNESOTA**

Innovator not given (Telex Comm., Inc.) Jan. 1981 See also DOE/NASA-CR-161437 (N80-25786)

**M-FS-25469** Vol. 5, No. 3, p. 311

Partial space heating for 97,000 square foot plant is supplied by 360 flat plate solar collectors; energy is sorted as heat in indoor 20,000 gallon water tank. System includes all necessary control electronics for year round operation. During December 1978, solar energy supplied 24.4 percent of building's space heating load.

**B80-10338**

**COSTS AND DESCRIPTION OF A SOLAR-ENERGY SYSTEM--AUSTIN, TEXAS**

Innovator not given (Radian Corp.) Jan. 1981 See also DOE/NASA-CR-161442 (N80-25784)

**M-FS-25472** Vol. 5, No. 3, p. 312

Heating and cooling system uses Fresnel lens concentrating collectors. Major system components are 36 collectors, 1,500 gallon thermal storage tank, absorption cooler, cooling tower, heating coil, pumps, heat exchanger, and backup heating and air conditioning. Final report includes detailed breakdown of component and installation costs for seven project subsystems.

**B80-10339**

**SOLAR ENERGY IN A HISTORICAL CITY--ABBREVILLE, SOUTH CAROLINA**

Innovator not given (Gilliland-Bell Assoc., Inc.) Jan. 1981 See also DOE/NASA-CR-161443 (N80-25788)

**M-FS-25479** Vol. 5, No. 3, p. 312

Direct air solar heating does not alter building appearances, winning approval of state and local historical societies. Final report on system contains performance data, drawings, photographs, and other information. Installation manual is included as appendix.

**B80-10340**

**MUNICIPAL RECREATION CENTER IS HEATED AND COOLED BY SOLAR ENERGY**

innovator not given (Travis-Braun and Assoc., Inc.) Jan. 1981 See also DOE/NASA-CR-161444 (N80-26766)

**M-FS-25478** Vol. 5, No. 3, p. 312

Major fraction of energy requirements for community building is supplied by Sun. The 238 flat plate solar collectors are roof mounted on single story structure enclosing gymnasium, locker area, and health care clinic; heat exchanger transfers collected energy to 6,000 gallon storage tank. Final report chronicles project from inception to completion, documenting performance, costs, operating modes, and data acquisition system. Appendix contains manufacturers' product literature and engineering drawings.

**B80-10341**

**SOLAR ENERGY MEETS 50 PERCENT OF MOTEL HOT WATER NEEDS--KEY WEST, FLORIDA**

Innovator not given (Quality Inn of Key West) Jan. 1981 See also DOE/NASA-CR-161434 (N80-23774)

**M-FS-25454** Vol. 5, No. 3, p. 313

Final report describes domestic water preheat installed in 148 room motel. Equipment meets 50 percent of needs when motel is 100 percent occupied; equivalently, it supplies 100 percent of hot water when occupancy is 50 percent. System consists of 1,400 square feet of flat plate liquid solar collectors, storage tanks, pump, controller, and hardware.

**B80-10342**

**SOLAR HEATED OFFICE COMPLEX--GREENWOOD, SOUTH CAROLINA**

Innovator not given (W. E. Gilbert & Assoc., Inc.) Jan. 1981 See also DOE/NASA-CR-161435 (N80-23776)

**M-FS-25458** Vol. 5, No. 3, p. 313

Report contains thorough documentation of project meeting 85 percent of building heat requirements. System uses roof mounted recirculating water solar panels and underground hot water energy storage. Aluminum film reflectors increase total solar flux captured by panels.

**B80-10343**

**RESIDENTIAL SYSTEM TESTED IN AN OFFICE--HUNTSVILLE, ALABAMA**

Innovator not given (IBM Federal Systems Div.) Jan. 1981 See also DOE/NASA-CR-161464 (N80-25790)

**M-FS-25481** Vol. 5, No. 3, p. 314

System does not meet its design specifications if not matched with intended application. Key differences between office and residential application were (1) space heating demand at office was greater than design value because thermostat was not held at 70 degrees F as specified, and (2) much energy collected and stored went unused because office used relatively little hot water. Report discusses observations and contains design, performance, and test information.

**B80-10344**

**SOLAR HEATED TWO LEVEL RESIDENCE--AKRON, OHIO**

Innovator not given (IBM Federal Systems Div.) Jan. 1981 See also DOE/NASA-CR-161465 (N80-25791)

**M-FS-25480** Vol. 5, No. 3, p. 314

Report describes 1 year evaluation of solar heating and hot water system which satisfied 24 percent of energy requirements. System uses flat plate solar collectors with air as heat transport medium. Rock storage bin stores collected energy; air to liquid heat pump supplies backup heat.

**B80-10345**

**SOLAR ENERGY WORKSHOP--TUCSON, ARIZONA**

Innovator not given (IBM Federal Systems Div.) Jan. 1981 See also DOE/NASA-CR-161450 (N80-25787)

**M-FS-25473** Vol. 5, No. 3, p. 314

Showplace for solar energy utilization includes complex solar heating and cooling system which supplies 95 percent of space heat requirements. Project utilized superior construction techniques and quality materials, and full time maintenance staff was assigned to keep systems operating.

**B80-10346**

**RESIDENTIAL SOLAR HOT WATER SYSTEM--TEMPE, ARIZONA**

Innovator not given (IBM Federal Systems Div.) Jan. 1981 See also DOE/NASA-CR-161466 (N80-26778)

**M-FS-25490** Vol. 5, No. 3, p. 315

Domestic hot water for single story home is heated by two 4 by 8 foot solar collectors. Solar energy saved 5.54 million Btu in six month period; savings with increased water consumption would be significantly higher.

**B80-10347**

**RESIDENTIAL SOLAR HEATING INSTALLATION--STILLWATER, MINNESOTA**

Innovator not given (Energy Resources Ctr. of Honeywell, Inc.) Jan. 1981 See also B80-10199; DOE/NASA-CR-161480 (N80-28861)

**M-FS-25504** Vol. 5, No. 3, p. 315

Report presents installer guidelines for network subsystems, including filling and testing. Information on operating procedures, controls, caution requirements, and routine scheduled maintenance is included as written procedures, schematics, detailed drawings, and manufacturer's component data.

**B80-10348**

**THREE STORY RESIDENCE WITH SOLAR HEAT--MANCHESTER, NEW HAMPSHIRE**

Innovator not given (IBM Federal Systems Div.) Jan. 1981 See

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also DOE/NASA-CR-161471(N80-27802)

**M-FS-25499** Vol. 5, No. 3, p. 315

When heat lost through ducts is counted for accurate performance assessment, solar energy supplied 56 percent of building's space heating load. Average outdoor temperature was 53 degrees F; average indoor temperature was 69 degrees F. System operating modes included heating from solar collectors, storing heat, heating from storage, auxiliary heating with oil fired furnace, summer venting, and hot water preheating.

**B80-10349**

**A HIGH SCHOOL IS SUPPLIED WITH SOLAR ENERGY-- DALLAS, TEXAS**

Innovator not given(Dallas Independent School District) Jan. 1981 See also DOE/NASA-CR-161482(N80-29847)

**M-FS-25514** Vol. 5, No. 3, p. 316

System preheats 100 percent of domestic hot water and supplies almost half of heating requirements for three story, concrete frame, brick building with basement. Final report includes details of installation, operation and maintenance, contract negotiation, and acceptance test plan.

**B80-10452**

**MULTIBEAM COLLIMATOR USES PRISM STACK**

P. O. MINOTT

Apr. 1981

**GSFC-12608**

Vol. 5, No. 4, p. 427

Optical instrument creates many divergent light beams for surveying and machine element alignment applications. Angles and refractive indices of stack of prisms are selected to divert incoming laser beam by small increments, different for each prism. Angles of emerging beams thus differ by small, precisely-controlled amounts. Instrument is nearly immune to vibration, changes in gravitational force, temperature variations, and mechanical distortion.

**B80-10453**

**PULSE-SHAPING CIRCUIT FOR LASER EXCITATION**

J. B. LAUDENSLAGER (Caltech) and T. J. PACALA (Caltech)

Apr. 1981

**NPO-14556**

Vol. 5, No. 4, p. 428

Narrower, impedance-matched pulses initiate stabler electric discharges for gas lasers. Discharges are more efficient, more compact, capable of high repetition rate, and less expensive than conventional electron-beam apparatus, but gas tends to break down and form localized arcs. Pulse-shaping circuit compresses width of high-voltage pulses from relatively-slow rise-time voltage generator and gradually grades circuit impedance from inherent high impedance of generator to low impedance of gas.

**B80-10454**

**FIELD LIMITER FOR SOLAR RADIOMETERS**

C. M. BERDAHL (Caltech)

Apr. 1981

**NPO-14781**

Vol. 5, No. 4, p. 429

Lenses project solar image onto aperture to exclude circumsolar radiation, more precisely measuring energy captured by receiver apertures of highly-concentrating solar thermal-energy converters. First version uses achromatic objective lens to form image of Sun at aperture ahead of radiometer cavity. Smaller second version with shorter focal length forms image magnified by another lens and thrown onto aperture. Both Versions require calibration against standard radiometer.

**B80-10455**

**GAS-LASER POWER MONITOR**

C. E. RUSS, JR.

Apr. 1981

**LANGLEY-12682**

Vol. 5, No. 4, p. 430

Device attaches simply to front of laser housing for continuous monitoring of power output. Monitor is calibrated to read either total output or power generated in test volume. It is fabricated from four black-anodized aluminum parts; crown glass positioned at Brewster angle reflects 0.33 percent of beam onto photodiode calibrated for electrical output proportional to laser power. Unlike conventional calorimeter, monitor does not interrupt laser

beams, and fast-response diode allows instantaneous tracking of power fluctuations.

**B80-10456**

**FIBER OPTICS TRANSMIT CLOCK SIGNAL MORE RELIABLY**

G. F. LUTES, JR. (Caltech)

Apr. 1981

**NPO-14749**

Vol. 5, No. 4, p. 430

Optical automatic gain control smooths maser clock amplitude fluctuations without phase shift. Uncomplicated optical system is more reliable than electrical transmission circuits which require phase-locked loops to compensate for shift. Maser feeds reference signal to linear fiber-optic analog transmitter which emits modulated laser beam directed to splitter. Splitter consists of dichroic mirrors and associated lenses for distributing beam to output ports. Cables attached there guide signals to receiving station.

**B80-10457**

**REDUCED VISCOSITY INTERPRETED FOR FLUID/GAS MIXTURES**

D. H. LEWIS (Caltech)

Apr. 1981

**NPO-14976**

Vol. 5, No. 4, p. 431

Analysis predicts decrease in fluid viscosity by comparing pressure profile of fluid/gas mixture with that of power-law fluid. Fluid is taken to be viscous, non-Newtonian, and incompressible; the gas to be ideal; the flow to be inertia-free, isothermal, and one dimensional. Analysis assists in design of flow systems for petroleum, coal, polymers, and other materials.

**B80-10458**

**TUNABLE PULSED CARBON DIOXIDE LASER**

G. J. MEGIE (Caltech) and R. T. MENZIES (Caltech)

Apr. 1981

**NPO-14984**

Vol. 5, No. 4, p. 432

Transverse electrically-excited-atmosphere (TEA) laser is continuously tunable over several hundred megahertz about centers of spectral lines of carbon dioxide. It is operated in single longitudinal mode (SLM) by injection of beam from continuous-wave, tunable-waveguide carbon dioxide laser, which serves as master frequency-control oscillator. Device measures absorption line of ozone; with adjustments, it is applicable to monitoring of atmospheric trace species.

**B80-10459**

**SHORT-RANGE SELF-PULSED OPTICAL RADAR**

C. M. BERDAHL (Caltech)

Apr. 1981

**NPO-14901**

Vol. 5, No. 4, p. 433

Laser for radar device is retriggered when previous laser pulse is reflected from target. Target range R is computed from number of pulses triggered per time interval. Radar accurately measures distances up to 500 meters; it is useful for determining surface shape of reflectors in large, high-gain, highly directional antennas and for other short-range surveying.

**B80-10460**

**SOLAR-SITE TEST MODULE**

R. R. KISSEL and D. R. SCOTT

Apr. 1981 See also DOE/NASA-TM-78291(N80-30899)

**M-FS-25543**

Vol. 5, No. 4, p. 433

Report describes small test set which interrogates solar-energy data acquisition systems. Lightweight, portable set includes microcomputer with keyboard, alphanumeric display, printer, cassette recorder/player for storing programs and data, and cable for connection to Site Data Acquisition System (SDAS). Unit is operated by BASIC program and Assembly language. Report is specific to DOE/NASA application yet contains general information to assist in designing similar units.

**B80-10461**

**EVALUATION OF AN EVACUATED-TUBE LIQUID SOLAR COLLECTOR**

Innovator not given(Solar Energy Systems Div. of Wyle

Labs) Apr. 1981 See also DOE/NASA-CR-161421(N80-24745); B80-10050

**M-FS-25450** Vol. 5, No. 4, p. 434

Indoor and outdoor thermal performances of collectors are compared in report. Tests conducted on indoor solar simulator with data from both diffuse and specular reflectors are presented graphically and in tables. Comparisons with previous data for prototype show effects of improved manifold.

**B80-10462**

#### **SOLAR WATER HEATER DESIGN PACKAGE**

Innovator not given(Elcam, Inc.) Apr. 1981 See also DOE/NASA-CR-150605(N80-27518)

**M-FS-25521** Vol. 5, No. 4, p. 434

Package describes commercial domestic-hot-water heater with roof or rack mounted solar collectors. System is adjustable to pre-existing gas or electric hot-water house units. Design package includes drawings, description of automatic control logic, evaluation measurements, possible design variations, list of materials and installation tools, and trouble-shooting guide and manual.

**B80-10463**

#### **FIVE-CITY ECONOMICS OF A SOLAR HOT-WATER-SYSTEM**

Innovator not given(Federal Systems Div. of IBM Corp.) Apr. 1981 See also DOE/NASA-CR-161510(N80-29854)

**M-FS-25532** Vol. 5, No. 4, p. 434

Report projects energy savings and system costs for five sites using analysis of actual solar energy installation performance in Togus, Maine. Maine system supplies 75 percent of hot water needed for single-family residence; economic payback period is 19 years. Benefits for all sites depend on maintenance or decrease of initial investment required and continuing increase in cost of conventional energy. Report includes analysis weighing potential changes in variables used to evaluate system profitability.

**B80-10464**

#### **ECONOMIC EVALUATION OF A SOLAR HOT-WATER-SYSTEM**

Innovator not given(Federal Systems Div. of IBM Corp.) Apr. 1981 See also DOE/NASA-CR-161492(N80-31872)

**M-FS-25529** Vol. 5, No. 4, p. 435

Analysis shows economic benefits at six representative sites using actual data from Tempe, Arizona and San Diego, California installations. Model is two-tank cascade water heater with flat-plate collector array for single-family residences. Performances are forecast for Albuquerque, New Mexico; Fort Worth, Texas; Madison, Wisconsin; and Washington, D.C. Costs are compared to net energy savings using variables for each site's environmental conditions, loads, fuel costs, and other economic factors; uncertainty analysis is included.

**B80-10465**

#### **RESIDENTIAL SOLAR-HEATING SYSTEM USES PYRAMIDAL OPTICS**

Innovator not given(Wormser Scientific Corp.) Apr. 1981 See also DOE/NASA-CR-161203(N80-33864)

**M-FS-25567** Vol. 5, No. 4, p. 435

Report describes reflective panels which optimize annual solar energy collection in attic installation. Subunits include collection, storage, distribution, and 4-mode control systems. Pyramid optical system heats single-family and multi-family dwellings.

**B80-10466**

#### **SOLAR-HEATED BANK-MARKS MISSISSIPPI**

Innovator not given(First National Bank of Clarksdale) Apr. 1981 See also DOE/NASA-CR-161549(N80-33858)

**M-FS-25558** Vol. 5, No. 4, p. 436

Report describes air solar-energy collectors which supply 60 percent of space heating load for full-service bank. Contemporary structure supports 468 square feet of flat-plate arrays, and features onsite temperature and power measurement readouts. Air-flow collectors minimize problems experienced with conventional liquid solar equipment and eliminate need for heat exchanger for space heating.

**B80-10467**

#### **SOLAR WATER-HEATING PERFORMANCE EVALUATION-SAN DIEGO, CALIFORNIA**

Innovator not given(Federal Systems Div. of IBM Corp.) Apr. 1981 See also DOE/NASA-CR-161481(N80-27806)

**M-FS-25502** Vol. 5, No. 4, p. 436

Report describes energy saved by replacing domestic, conventional natural gas heater with solar-energy subsystem in single-family residence near San Diego, California. Energy savings for 6 month test period averaged 1.089 million Btu. Collector array covered 65 square feet and supplied hot water to both 66-gallon solar storage tank and 40-gallon tank for domestic use. Natural gas supplied house's auxiliary energy.

**B80-10468**

#### **SOLAR-HEATED AND COOLED SAVINGS AND LOAN BUILDING-1-LEAVENWORTH, KANSAS**

Innovator not given(Mutual Savings & Loan Association of Leavenworth, Kansas) Apr. 1981 See also DOE/NASA-CR-161484(N80-29848)

**M-FS-25520** Vol. 5, No. 4, p. 436

Report describes heating and cooling system which furnishes 90 percent of annual heating load, 70 percent of cooling load, and all hot water for two-story building. Roof-mounted flat-plate collectors allow three distinct flow rates and are oriented south for optimum energy collection. Building contains fully automated temperature controls is divided into five temperature-load zones, each with independent heat pump.

**B80-10469**

#### **SOLAR-ENERGY LANDMARK BUILDING--COLUMBIA, MISSOURI**

Innovator not given(Building and Grounds Department of Stephens College) Apr. 1981 See also DOE/NASA-CR-161485(N80-29849)

**M-FS-25524** Vol. 5, No. 4, p. 437

Report includes design, cost, installation, maintenance, and performance details for attractive solar installation which supplies space heating for four-story Visitors Center. 176 hydronic flat-plate collectors, water-to-water heat exchanger, and 5,000-gallon storage tank comprise system which provides 71 percent of building's heat. Natural-gas-fired boiler supplies auxiliary hot water to heating system when necessary.

**B80-10470**

#### **SOLAR HEATING FOR AN OBSERVATORY--LINCOLN, NEBRASKA**

Innovator not given(Federal Systems Div. of IBM Corp.) Apr. 1981 See also DOE/NASA-CR-161495(N80-29851)

**M-FS-25525** Vol. 5, No. 4, p. 437

Report describes solar-energy system for 50 seat observatory that provides 60 percent of space heating needs. System includes 9 flat-plate collectors, rock storage bin, blowers, controls, ducting, and auxiliary natural-gas furnace; it has five operation modes. Net energy savings were 11.31 million Btu for 12 months, or equivalent of 1.9 barrels of oil. Report appendixes list performance factor definitions, performance equations, and average area weather conditions.

**B80-10471**

#### **TWO-STORY RESIDENCE WITH SOLAR HEATING--NEWMAN, GEORGIA**

Innovator not given(Federal Systems Div. of IBM Corp.) Apr. 1981 See also DOE/NASA-CR-161494(N80-29853)

**M-FS-25526** Vol. 5, No. 4, p. 438

Report evaluates performance of warm-air collector system for 11 month period and provides operation and maintenance information. System consists of 14 warm air collectors, rock-storage bin, air handler, heat exchangers, hot-water preheat tank, associated controls, plumbing, and air ducting. Average building temperature was maintained at 72 F (22 C); solar equipment provided 47 percent of space-heating requirement.

**B80-10472**

#### **SOLAR-ENERGY HEATS A TRANSPORTATION TEST CENTER--PUEBLO, COLORADO**

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Innovator not given(Federal Systems Div. of IBM Corp.) Apr. 1981 See also DOE/NASA-CR-161493(N80-29850)

**M-FS-25527** Vol. 5, No. 4, p. 438

Petroleum-base, thermal energy transport fluid circulating through 583 square feet of flat-plate solar collectors accumulates majority of energy for space heating and domestic hot-water of large Test Center. Report describes operation, maintenance, and performance of system which is suitable for warehouses and similar buildings. For test period from February 1979 to January 1980, solar-heating fraction was 31 percent, solar hot-water fraction 79 percent.

**B80-10473**  
**SINGLE-FAMILY-RESIDENCE SOLAR HEATING--CARLSBAD, NEW MEXICO**

Innovator not given(Federal Systems Div. of IBM Corp.) Apr. 1981 See also DOE/NASA-CR-161508(N80-29856)

**M-FS-25528** Vol. 5, No. 4, p. 438

Solar-heating and hot-water system includes 408 square feet of flat-plate air collectors, rock storage bin, energy transport system, air-to-water heat exchanger, controls, and hot-water preheat tank. Hot-air oil furnace supplies auxiliary space heating, and electricity powers air-handler blower and hot water preheat pump. For 12 month period, system provided 43 percent of space-heating and 53 percent of hot-water energy; net energy savings were 23.072 million Btu.

**B80-10474**  
**MULTIMODE SOLAR-HEATING SYSTEM--COLUMBIA, SOUTH CAROLINA**

Innovator not given(Federal Systems Div. of IBM Corp.) Apr. 1981 See also DOE/NASA-CR-161546(N80-31880)

**M-FS-25552** Vol. 5, No. 4, p. 439

Report describes failure of six-mode pyramidal-optics system to reduce winter energy savings. Over 12 month period, control problems, energy dissipation, and high operating-energy requirements undermined system efficiency. Energy savings were maximal when system in direct space-heating or hot-water preheating mode. In least efficient mode, heat pumps alternatively mingled storage or collector energy, and space heating was provided by electric heat strip.

**B80-10475**  
**SOLAR-HEATED SWIMMING SCHOOL--WILMINGTON, DELAWARE**

Innovator not given(Cooperson Brack Association) Apr. 1981 See also DOE/NASA-CR-161538(N80-31878)

**M-FS-25548** Vol. 5, No. 4, p. 439

Report describes operation, installation, and performance of solar-energy system which provides alternative to natural gas pool heating. System is comprised of 2,500 square feet of liquid flat-plate collectors connected to 3,600 gallon; gallon-gallon storage tank, with microcomputer-based controls. Extension of building incorporates vertical-wall, passive collection system which provides quarter of heated fresh air for office.

**B80-10476**  
**WINTER PERFORMANCE OF A DOMESTIC SOLAR-HEATING SYSTEM--DUFFIELD, VIRGINIA**

Innovator not given(Federal Systems Div. of IBM Corp.) Apr. 1981 See also DOE/NASA-CR-161507(N80-30892)

**M-FS-25540** Vol. 5, No. 4, p. 439

Sunlight supplies 39 percent of heat load, saving 9 barrels of fuel oil in one heating season. Report describes system installation in two-story, single-family residence. Energy is collected with roof-mounted air flat-plate collectors, stored in rock bin, and transferred to water preheat tank whenever system is storing energy; heat pump supplies heat to house.

**B80-10477**  
**ONE-YEAR ASSESSMENT OF A SOLAR SPACE/WATER HEATER--CLINTON, MISSISSIPPI**

Innovator not given(Federal Systems Div. of IBM Corp.) Apr. 1981 See also DOE/NASA-CR-161509(N80-30893)

**M-FS-25539** Vol. 5, No. 4, p. 440

Unit called 'System 4' integrated into space-heating and

hot-water systems of dormitory satisfied 32 percent of building heat load. System 4 includes flat-plate air collectors, circulation blowers, rock storage bed with heat exchanger, two hot water tanks, and auxiliary heaters. Report describes performance of system and subsystems, operating-energy requirements and savings, and performance parameters.

**B80-10478**  
**FIRE-STATION SOLAR-ENERGY SYSTEM--KANSAS CITY, MISSOURI**

Innovator not given(City of Kansas City, Missouri) Apr. 1981 See also DOE/NASA-CR-161513(N80-30895)

**M-FS-25538** Vol. 5, No. 4, p. 440

Screen-walled, flat-plate air collectors are part of award-winning architectural design; concrete-box storage subsystem, domestic hot-water preheat tank, blowers, pumps, heat exchangers, ducting, controls, and plumbing complete solar system. Design provides half of space heating and 75 percent of heat for domestic hot-water for fire station. Report includes historical narrative of project along with detailed drawings, charts, and product literature.

**B80-10479**  
**SOLAR-HEATED RANGER STATION--GLENDO, WYOMING**

Innovator not given(Federal Systems Div. of IBM Corp.) Apr. 1981 See also DOE/NASA-CR-161520(N80-30896)

**M-FS-25537** Vol. 5, No. 4, p. 440

Report evaluates solar-energy system in residential ranger station. Installation provided 22 percent of space-heating and 58 percent of hot-water energy requirements. Annual net energy savings were 30 million Btu. Report describes system and its subsystems: collector array, storage, hot-water, and space-heating. Average weather conditions of test site, performance values, and energy savings are listed.

**B80-10480**  
**ECONOMIC EVALUATION OF A SOLAR HOT-WATER SYSTEM--PALM BEACH COUNTY, FLORIDA**

Innovator not given(Federal Systems Div. of IBM Corp.) Apr. 1981 See also DOE/NASA-CR-161512(N80-30894)

**M-FS-25536** Vol. 5, No. 4, p. 441

Report projects solar-energy costs and savings for residential hot-water system over 20 year period. Evaluation uses technical and economic models with inputs based on working characteristics of installed system. Primary analysis permits calculation of economic viability for four other U.S. sites.

**B80-10481**  
**RESIDENTIAL SYSTEM--LANSING, MICHIGAN**

Innovator not given(Federal Systems Div. of IBM Corp.) Apr. 1981 See also DOE/NASA-CR-161491(N80-29855)

**M-FS-25530** Vol. 5, No. 4, p. 411

Air collectors are combined with water storage to supply 15 percent of space-heating and hot-water load to residence. Report discusses typical system operation, energy savings, and maintenance for 11 month period. Although unusual combination of water storage with air collecting medium creates loss of heat exchanging efficiency, net energy savings were 21 million Btu.

**B80-10482**  
**SOLAR SPACE-HEATING SYSTEM--YOSEMITE NATIONAL PARK, CALIFORNIA**

Innovator not given(Federal Systems Div. of IBM Corp.) Apr. 1981 See Also DOE/NASA-CR-161539(N80-31883)

**M-FS-25553** Vol. 5, No. 4, p. 442

A 12 months performance of Visitors Center installation suffered from low insolation, high energy dissipation, and equipment breakdown. System has 980 square feet of liquid flat-plate collectors, water energy storage, 4-mode control, heat exchangers, pumps, and plumbing. Design expected system to supply over 50 percent of annual heating demand, but only 109 million Btu were conserved.

**B80-10483**  
**MOTEL SOLAR-HOT-WATER SYSTEM--DALLAS, TEXAS**

Innovator not given(Day's Inn of America, Inc.) Apr. 1981 See also DOE/NASA-CR-161570(N81-10521)

**M-FS-25575** Vol. 5, No. 4, p. 442

Report describes system which meets 64 percent of hot water requirements of 120 room motel. Key system components include 1,000 square foot, roof-mounted collector array, 1,000 gallon storage tank, tube-in-shell heat exchanger, and three domestic hot-water tanks. Report contains calibration instructions for differential temperature controllers, shutdown procedures, and operation guidelines, performance analysis, and manufacturers' maintenance literature.

**B80-10484**

**MOTEL SOLAR-HOT-WATER SYSTEM WITH NONPRESSURIZED STORAGE--JACKSONVILLE, FLORIDA**

Innovator not given(Day's Inn of America, Inc.) Apr. 1981 See also DOE/NASA-CR-161560(N81-10523)

**M-FS-25569** Vol. 5, No. 4, p. 432

Modular roof-mounted copper-plated arrays collect solar energy; heated water drains from them into 1,000 gallon nonpressurized storage tank which supplies energy to existing pressurized motel hot water lines. System provides 65 percent of hot water demand. Report described systems parts and operation, maintenance, and performance and provides warranty information.

**B80-10485**

**CLOSED-CIRCULATION SYSTEM FOR MOTEL HOT WATER--SAVANNAH, GEORGIA**

Innovator not given(Day's Inn of America, Inc.) Apr. 1981 See also DOE/NASA-CR-161561(N81-10523)

**M-FS-25572** Vol. 5, No. 4, p. 433

Inexpensive guy wires support roof-mounted solar-energy collectors. Mounting system withstands 120 mph winds with no roof penetrations. Collectors circulate 50 percent ethylene glycol solution eliminating need for drain system for freeze protection. Heat exchanger transfers energy to domestic hot water which heats to 140 F.

**B80-10486**

**SOLAR HEATING FOR A RESTAURANT--NORTH LITTLE ROCK, ARKANSAS**

Innovator not given(Shoney's South, Inc.) Apr. 1981 See also DOE/NASA-CR-161557(N81-10520)

**M-FS-25568** Vol. 5, No. 4, p. 443

Hot water consumption of large building affects solar-energy system design. Continual demand for hot water at restaurant makes storage less important than at other sites. Storage capacity of system installed in December 1979 equals estimated daily hot-water requirement. Report describes equipment specifications and modifications to existing building heating and hot water systems.

**B80-10487**

**MOTEL SOLAR HOT-WATER INSTALLATION--ATLANTA, GEORGIA**

Innovator not given(Day's Inn of America, Inc.) Apr. 1981 See also DOE/NASA-CR-161559(N81-10519)

**M-FS-25564** Vol. 5, No. 4, p. 443

Analysis of hardness of local water, average insolation for site, and daily hot water requirements insures suitability of solar-energy system design. Report describes two units which are designed to supply 81 percent of motel's annual hot water demand based on hypothetical 85 percent occupancy. Report includes drawings, operating and maintenance instructions, and test results for 1 day of operation.

**B80-10488**

**BUILDING WITH INTEGRAL SOLAR-HEAT STORAGE--STARKVILLE, MISSISSIPPI**

Innovator not given(Security State Bank, Starkville, Mississippi) Apr. 1981 See also DOE/NASA-CR-161550(N81-10518)

**M-FS-25559** Vol. 5, No. 4, p. 444

Column supporting roof also houses rock-storage bin of solar-energy system supplying more than half building space

heating load. Conventional heaters supply hot water. Since bin is deeper and narrower than normal, individual pebble size was increased to keep airflow resistance at minimum.

## 04 MATERIALS

**B80-10059**

**CONTAINERLESS MATERIALS PROCESSING IN THE LABORATORY**

L. L. LACY, D. B. NISEN, T. J. RATHZ, and M. B. ROBINSON Aug. 1980

**M-FS-25242** Vol. 5, No. 1, p. 45

Drop tube makes possible preparation of exotic materials. The 100 foot tube is oriented precisely vertical to prevent free-falling drop from hitting tube walls. Inert-gas supply, evacuation pumps, viewing ports, and flexibility in choice of melt technique allow precise control and monitoring of solidification.

**B80-10060**

**MEASURING COAL DEPOSITS BY RADAR**

T. A. BARR

Aug. 1980

**M-FS-23922** Vol. 5, No. 1, p. 46

Front-surface, local-oscillator radar directly compares frequency of signals reflected from front and back surfaces of coal deposits. Thickness is measured directly as frequency difference. Transmitter is frequency modulated, so thickness is computed directly from frequency difference. Because front and back reflections are detected in combination rather than separately, masking of comparatively weak back signal is less problem. Also system is not sensitive to extraneous reflections from targets between transmitting antenna and coal surface.

**B80-10061**

**DETECTING A COAL/SHALE INTERFACE**

P. H. BROUSSARD, J. L. BURCH, R. A. CAMPBELL, E. J. DROST, J. L. HUDGINS, P. W. MORRIS, H. REID, JR., R. J. STEIN, and J. E. ZIMMERMAN

Aug. 1980

**M-FS-23720** Vol. 5, No. 1, p. 47

Detector, intended for use with longwall shearer, determines when cut has pierced through coal layer. Accelerometer measures hardness of material struck by penetrometer ram, while reflectometers measure reflectivity of surface on either side of penetrometer. Signals are combined in voting circuit that indicates 'coal' or 'shale', depending on information supplied by three sensors. It distinguishes by differences in accelerometer waveforms.

**B80-10062**

**FAST-RESPONSE ATMOSPHERIC-POLLUTANT MONITOR**

D. I. SEBACHER

Aug. 1980 See also NASA-TP-1113 (N78-13408)

**LANGLEY-12317** Vol. 5, No. 1, p. 48

Fast infrared spectrometer measures atmospheric CO, CH<sub>4</sub>, and HCl over range of 1 to 12 ppm. With modifications it could measure other pollutants and use natural light as source. Cell filled with sample to be measured filters out spectral lines of interest. Infrared beam passes through rotating cell holder that produces chopped signals at two frequencies. Difference in signal amplitudes depends on amount of test gas in sample. Signal processing circuitry amplifies and separates test-gas and reference signals.

**B80-10063**

**FIRE TESTS FOR AIRPLANE INTERIOR MATERIALS**

E. A. TUSTIN (Boeing Co.)

Aug. 1980 See also NASA-CR-145658 (N79-19112)

**MSC-18478** Vol. 5, No. 1, p. 49

Large scale, simulated fire tests of aircraft interior materials

## 04 MATERIALS

were carried out in salvaged airliner fuselage. Two 'design' fire sources were selected: Jet A fuel ignited in fuselage midsection and trash bag fire. Comparison with six established laboratory fire tests show that some laboratory tests can rank materials according to heat and smoke production, but existing tests do not characterize toxic gas emissions accurately. Report includes test parameters and test details.

### B80-10064

#### REDOX ELECTROCHEMICAL ENERGY STORAGE

L. H. THALLER

Aug. 1980 See also NASA-TM-X-71540 (N74-21688)

LEWIS-13398

Vol. 5, No. 1, p. 50

Reservoirs of chemical solutions can store electrical energy with high efficiency. Reactant solutions are stored outside conversion section where charging and discharging reactions take place. Conversion unit consists of stacks of cells connected together in parallel hydraulically, and in series electrically. Stacks resemble fuel cell batteries. System is 99% ampere-hour efficient, 75% watt hour efficient, and has long projected lifetime. Applications include storage buffering for remote solar or wind power systems, and industrial load leveling. Cost estimates are \$325/kW of power requirement plus \$51/kWh storage capacity. Mass production would reduce cost by about factor of two.

### B80-10065

#### ADDITIVE IMPROVES ENGINE-OIL PERFORMANCE

A. J. BABECKI and H. C. FLETCHER

Aug. 1980

GSFC-12327

Vol. 5, No. 1, p. 51

Tests of metal erosion in operating engines show that addition of 5% tricresyl phosphate significantly reduces wear rate. Commercial 10W30 oil gives one tenth wear and degrades less with additive.

### B80-10066

#### DRILLING SIDE HOLES FROM A BOREHOLE

E. R. COLLINS, JR. (Caltech)

Aug. 1980

NPO-14465

Vol. 5, No. 1, p. 52

Machine takes long horizontal stratum samples from confines of 21 cm bore hole. Stacked interlocking half cylindrical shells mate to form rigid thrust tube. Drive shaft and core storage device is flexible and retractable. Entire machine fits in 10 meter length of steel tube. Machine could drill drainage or ventilation holes in coal mines, or provide important information for geological, oil, and geothermal surveys.

### B80-10067

#### CORROSION-RESISTANT CERAMIC THERMAL BARRIER COATING

P. E. HODGE, S. R. LEVINE, and R. A. MILLER

Aug. 1980

LEWIS-13088

Vol. 5, No. 1, p. 53

Two-layer thermal barrier coating, consisting of metal-CrAlY bond coating and calcium silicate ceramic outer layer, greatly improves resistance of turbine parts to hot corrosion from fuel and air impurities. Both layers can be plasma sprayed, and ceramic layer may be polished to reduce frictional losses. Ceramic provides thermal barrier, so parts operate cooler metal temperatures, coolant flow can be reduced, or gas temperatures increased. Lower grade fuels also can be used.

### B80-10068

#### REDUCING STATIC CHARGES IN FLUIDIZED BED REACTIONS

T. WYDEVEN, E. V. BALLOU (San Jose State Univ. Foundation),

P. C. WOOD (San Jose State Univ. Foundation), and L. A. SPITZE

(San Jose State Univ.)

Aug. 1980

ARC-11245

Vol. 5, No. 1, p. 54

Radio frequency glow discharge apparatus ionizes fluidizing gas, making it conductive enough to neutralize static charge on fluidized particles. Particles agglomerate less, and in one case reactant loading capacity was increased six fold.

### B80-10069

#### TRANSFERRING SMALL SAMPLES OF VISCOUS LIQUID

B. W. MILLER (Rockwell International Corp.), S. M. MITCHELL (Rockwell International Corp.), and J. N. OLNEY (Rockwell International Corp.)

Aug. 1980

MSC-18533

Vol. 5, No. 1, p. 55

To avoid trapped air bubbles, fluid after removing plunger. Plunger is reinserted, syringe inverted, and air bubbles expelled by depressing plunger. Technique makes it easy to control sample quantities as small as one microliter, without problems from bubbles created by plunger suction.

### B80-10070

#### COAL CONVERSION AND SYNTHETIC-FUEL PRODUCTION

R. BRADFORD, W. T. ATKINS (BDM Corp.), R. M. BASS (BDM Corp.), R. DASCHER (BDM Corp.), J. DUNKIN (BDM Corp.), N. LUCE (BDM Corp.), W. SEWARD (BDM Corp.), and D. WARREN (BDM Corp.)

Aug. 1980

M-FS-25330

Vol. 5, No. 1, p. 56

Report evaluates potential coal gasification and synthetic-fuel production technologies for 1985 to 1990. Book includes overview of present and future technical and economic potential, ways of evaluating gasification facility designs, discussion of promising processes, characterization of potential markets, and list of available gasification systems.

### B80-10071

#### UNDERGROUND COAL MINING

G. M. HILL (Caltech)

Aug. 1980

NPO-14704

Vol. 5, No. 1, p. 56

Computer program models coal-mining production, equipment failure and equipment repair. Underground mine is represented as collection of work stations requiring service by production and repair crews alternately. Model projects equipment availability and productivity, and indicates proper balance of labor and equipment. Program is in FORTRAN IV for batch execution; it has been implemented on UNIVAC 1108.

### B80-10204

#### A TEMPERATURE FIXED POINT NEAR 58 C

M. E. GLICKSMAN (Rensselaer Polytech. Inst.)

Sep. 1980

M-FS-25304

Vol. 5, No. 2, p. 179

Triple-point cell constrains about 300 g of high-purity succinonitrile. Experiments show that lower 4 cm of thermometer well are virtually isothermal, making placement of thermometer not very critical. Bulb at bottom of well helps to prevent solid succinonitrile mantle from slipping.

### B80-10205

#### REMOVAL OF HYDROGEN BUBBLES FROM NUCLEAR REACTORS

R. V. JENKINS

Sep. 1980

LANGLEY-12597

Vol. 5, No. 2, p. 180

Method proposed for removing large hydrogen bubbles from nuclear environment uses, in its simplest form, hollow spheres of palladium or platinum. Methods would result in hydrogen bubble being reduced in size without letting more radioactivity outside reactor.

### B80-10206

#### PLASTICIZER FOR POLYIMIDE COMPOSITES

T. L. ST. CLAIR (V.P.I. & State Univ.) and J. M. BUTLER

Sep. 1980

LANGLEY-12642

Vol. 5, No. 2, p. 180

Problem of maintaining good prepreg tack and drape has been solved by modification of addition polyimide. Tack and drape are ability of prepreg to adhere to adjacent plies and to conform to desired shape during layup process. Alternate approach allows both longer life of polymer prepreg and processing of low-void laminates. It appears to be applicable to all addition polyimide systems. Modified addition polyimide takes advantage of reactive



liquid plasticizer, monoethylphthalate, which is used in place of solvent. Because of low vapor pressure of reactive liquid, it is retained and, thereby, tack and flexibility of prepreg are retained.

**B80-10207****IMPROVED ADHERENCE OF TiC COATINGS TO STEEL**

W. A. BRAINARD and D. R. WHEELER

Sep. 1980 See also NASA TP-1377(N79-15184)

**LEWIS-13169**

Vol. 5, No. 2, p. 181

Modified process for RF sputtering of titanium carbide coatings onto 440-C steel has resulted in improved adherence. Small partial pressure of nitrogen, approximately 0.5 percent, during first minutes of deposition marked by improved adherence, friction, and wear properties when compared with coatings applied on sputter-etched surfaces, or oxidized surfaces or in presence of small oxygen partial pressure. X-ray photoelectron spectroscopy and X-ray diffraction were used to characterize resultant coatings.

**B80-10208****HYBRID POLYMER MICROSPHERES**

A. REMBAUM (Caltech)

Sep. 1980

**NPO-14462**

Vol. 5, No. 2, p. 182

Techniques have been successfully tested for bonding polymeric spheres, typically 0.1 micron in diameter, to spheres with diameter up to 100 microns. Hybrids are being developed as improved packing material for ion-exchange columns, filters, and separators.

**B80-10209****COMPOSITES FOR AEROPROPULSION**

G. M. AULT and J. C. FRECHE

Sep. 1980

**LEWIS-13438**

Vol. 5, No. 2, p. 183

Report summarizes status of composite materials for aeropropulsion. It describes key advances made in past several years and lists 47 references published from 1971 to 1979.

**B80-10210****LUBRICATION HANDBOOK**

Innovator not given (Midwest Res. Inst.) Sep. 1980

**M-FS-25158**

Vol. 5, No. 2, p. 183

Handbook is divided into two major parts: solid lubricants and liquid lubricants used in aerospace industry. Listed materials cover broad application spectrum from manufacturing and ground support to missile and spacecraft hardware. Handbook can serve as ready reference in design and maintenance service of industrial equipment.

**B80-10211****METHANE/AIR FLAMES IN A CONCENTRIC TUBE COMBUSTOR**

N. C. MARKATOS (Concentration, Heat and Momentum Ltd.),

D. B. SPALDING (Concentration, Heat and Momentum Ltd.),

and S. K. SRTVATSA (Concentration, Heat and Momentum Ltd.)

Sep. 1980

**LEWIS-13388**

Vol. 5, No. 2, p. 184

Computer program gives realistic prediction of hydrodynamics and chemical reaction in reverse-flow two-concentric-tube combustor. Special attention is given to formation of oxides of nitrogen in combustion process. Program is written in FORTRAN IV for batch execution.

**B80-10350****HEAT RESISTANT POLYPHOSPHAZENE POLYMERS**

L. L. FEWELL, H. R. ALLCOCK (Pennsylvania State Univ.), J. P.

OBRIEN (Pennsylvania State Univ.), and A. G. SCOPELIANOS

(Pennsylvania State Univ.)

Jan. 1981

**ARC-11176**

Vol. 5, No. 3, p. 319

Polymers of carboranyl substituted polyphosphazene are stable at high temperatures and produce insulating char upon pyrolysis. Substituted compounds are prepared by heat polymerizing carboranyl halophosphazene, which is obtained by reacting lithium carborane with, for example, hexachlorocyclotriphosphazene

under anhydrous conditions. Chlorine of polymer may be replaced by aryloxy and alkoxy groups.

**B80-10351****OXIDE DISPERSION STRENGTHENED SUPERALLOY**

T. K. GLASGOW, Y. G. KIM (Inco R and D Ctr.), L. R. CURWICK

(Inco R and D Ctr.), and H. F. MERRICK (Inco R and D Ctr.)

Jan. 1981 See also NASA-CR-135150(N77-22213); NASA-

CR-159493(N80-13218); NASA-TM-79088(N79-20180)

**LEWIS-13589**

Vol. 5, No. 3, p. 320

MA6000E alloy is strengthened at high temperatures by dispersion of yttrium oxide. Strength properties are about twice those of conventional nickel base alloys. Good thermal fatigue, intermediate temperature strength, and good oxidation resistance give alloy unique combination of benefits. Application in aircraft gas turbine is improved.

**B80-10352****LOW COST HIGH TEMPERATURE, DUPLEX COATING FOR SUPERALLOYS**

S. G. YOUNG and D. L. DEADMORE

Jan. 1981 See also NASA-TM-79178(N79-29292)

**LEWIS-13497**

Vol. 5, No. 3, p. 321

Duplex silicon-slurry/aluminide coating substantially improves high temperature resistance to oxidation and corrosion of nickel base alloys. Coating used in critical sections of power systems like turbojet engines extends their operating capabilities.

**B80-10353****IMPROVED METALLIC AND THERMAL BARRIER COATINGS**

S. STECURA

Jan. 1981 See also NASA-TM-79206(N7929293); NASA-TM-

78976(N78-31212)

**LEWIS-13324**

Vol. 5, No. 3, p. 321

Low thermal conductivity two layer ceramic coatings are efficient thermal barriers between cooled metallic components and high temperature combustion gases. Potential components are combustors, blades, and vanes in aircraft engines of power-generating turbines. Presence of two layer coatings greatly reduces temperature and coolant requirements.

**B80-10354****RESIN CHAR OXIDATION RETARDANT FOR COMPOSITES**

K. J. BOWLES and R. E. GLUYAS

Jan. 1981 See also NASA-TM-79314(N80-14196); NASA-TM-

79288(N80-13171)

**LEWIS-13275**

Vol. 5, No. 3, p. 322

Boron powder stabilizes char, so burned substances are shiny, smooth, and free of loose graphite fibers. Resin weight loss of laminates during burning in air is identical for the first three minutes for unfilled and boron-filled samples, then boron samples stabilize.

**B80-10355****COMPOSITES WITH NEARLY ZERO THERMAL EXPANSION**

T. J. DUNN, A. J. CWIERTNY, JR. (McDonnell Douglas Corp.),

V. L. FREEMAN (McDonnell Douglas Corp.), and R. JOHNSON,

JR. (McDonnell Douglas Corp.)

Jan. 1981 See also NASA-CR-160558(N80-19144)

**MSC-18724**

Vol. 5, No. 3, p. 323

Graphite, glass, and resin composite is very strong, stiff, and thermally stable. As mounting material for antennas, mirrors and lenses, composite minimizes structural distortion and misalignment. Rods of substance are made by pulling prepreg-nated ribbon of glass and graphite through die. When materials are combined in proper proportion, graphite contracts, and glass and resin expand as temperature increases. Matrix for fiber may be polysulfane, epoxy, polyimide, or other resin.

**B80-10356****CARBON SCRUBBER**

M. S. FRANT (Orion Res., Inc.)

Jan. 1981

**MSC-16531**

Vol. 5, No. 3, p. 324

Inorganic carbon is removed from samples to be analyzed

## 04 MATERIALS

for 'total organic carbon'. In automated water analysis systems, semipermeable membrane separates two sample streams, one treated with acid, other with base. Carbonate and bicarbonated ions are converted to dissolved CO<sub>2</sub> by acid; reverse process occurs in basic stream. Only CO<sub>2</sub> is passed by membrane, from acid treated stream to base treated stream. Acidic stream emerges free of all inorganic carbon.

**B80-10357**

### **ELECTRICALLY CONDUCTIVE PALLADIUM-CONTAINING POLYIMIDE FILMS**

A. K. ST. CLAIR, T. A. FURTSCH (VPI&SU), and L. T. TAYLOR (VPI&SU)

Jan. 1981

**LANGLEY-12629**

**Vol. 5, No. 3, p. 326**

Palladium addition makes light, flexible film with low resistivity to relieve space charging. Polyimide film is prepared in four steps: preparation of polyamic acid in polar solvent; addition of soluble palladium complex salt; fabrication of film of 'palladium polyamic acid' solution; and thermal imidization of film to palladium-containing polyimide by 300 C heating. Lowered resistivities were achieved without loss in film flexibility or increase in film weight.

**B80-10358**

### **ALUMINUM IONS ENHANCE POLYIMIDE ADHESIVE**

A. K. ST. CLAIR, T. L. ST. CLAIR, and L. T. TAYLOR (VPI&SU)

Jan. 1981

**LANGLEY-12640**

**Vol. 5, No. 3, p. 326**

Adding complexed aluminum ions raises useful temperature of polyimide adhesive without embrittling it or reducing long term stability. Adhesives may be applied to prepared substrate surface without supports. Possible substrates are metal, composite, or polymeric film. Adhesive is excellent where bond flexibility is required.

**B80-10359**

### **SIMULTANEOUS MEASUREMENT OF THREE ATMOSPHERIC POLLUTANTS**

M. P. SINHA (Caltech)

Jan. 1981

**NPO-14828**

**Vol. 5, No. 3, p. 327**

Method enables simultaneous concentration monitoring of atmospheric SO<sub>2</sub>, NO, and NO<sub>2</sub>. Fluorescing pollutant gases in sample are excited by visible output of dye laser and its second-harmonic ultraviolet frequencies. Three photomultipliers, each with suitable optical filters, view fluorescence. Method tests ambient air, stack emissions, and highway automotive exhausts.

**B80-10360**

### **AEROSOL LASTS UP TO SIX MINUTES**

M. A. APPEL (Caltech)

Jan. 1981

**NPO-14947**

**Vol. 5, No. 3, p. 328**

Simple aerosol generator catalytically converts hydrogen peroxide to super-heated steam and then mixes steam with dye. Highly visible mist lasts for 6 minutes and can be used to study aerodynamic turbulence. Method does not depend on formation of ice crystals at cold high altitudes and is environmentally safe.

**B80-10361**

### **HIGH CHAR YIELD EPOXY CURING AGENTS**

P. DELVIGS, T. T. SERAFINI, and R. D. VANUCCI

Jan. 1981 See also NASA-TM-79226(N79-29240)

**LEWIS-13226**

**Vol. 5, No. 3, p. 328**

Class of imide-amine curing agents preserves structural integrity, prevents fiber release, and is fully compatible with conventional epoxy resins; agents do not detract from composite properties while greatly reducing char yield. Materials utilizing curing are used in aerospace, automotive, and other structural components where deterioration must be minimized and fiber release avoided in event of fire.

**B80-10362**

### **CAP PROTECTS AIRCRAFT NOSE CONE**

C. F. BRYAN, JR. and D. C. BRYAN

Jan. 1981

**LANGLEY-12367**

**Vol. 5, No. 3, p. 329**

Inexpensive, easily fabricated cap protects aircraft nose cone from erosion. Made of molded polycarbonate, cap has been flight tested at both subsonic and supersonic speeds. Its strength and erosion characteristics are superior to those of fiberglass cones.

**B80-10363**

### **LASER BEAM METHANE DETECTOR**

E. D. HINKLEY, JR. (Caltech)

Jan. 1981

**NPO-14929**

**Vol. 5, No. 3, p. 330**

Instrument uses infrared absorption to determine methane concentration in liquid natural gas vapor. Two sensors measure intensity of 3.39 mm laser beam after it passes through gas; absorption is proportional to concentration of methane. Instrument is used in modeling spread of LNG clouds and as leak detector on LNG carriers and installations. Unit includes wheels for mobility and is both vertically and horizontally operable.

**B80-10364**

### **REDUCED HYDROGEN PERMEABILITY AT HIGH TEMPERATURES**

J. R. STEPHENS, W. D. KLOPP, and J. A. MISENICK

Jan. 1981

**LEWIS-13486**

**Vol. 5, No. 3, p. 331**

CO and CO<sub>2</sub> reduce hydrogen loss through iron, nickel, and cobalt based alloy tubes. Method is based on concept that oxide film on metal surface reduces hydrogen permeability through metal; adding CO or CO<sub>2</sub> forms oxide films continuously during operation, and hydrogen containment is improved. Innovation enhances prospects for Stirling engine system utilization.

**B80-10365**

### **CHLORINOLYSIS RECLAIMS RUBBER OF WASTE TIRES**

E. R. DUFRESNE (Caltech), J. H. TERVET (Caltech), and G. G. HULL (Caltech)

Jan. 1981

**NPO-14935**

**Vol. 5, No. 3, p. 331**

Process reclaims rubber and reduces sulfur content by using chlorine gas to oxidize sulfur bonds in preference to other bonds. Rubber does not have poor hysteresis and abrasion resistance like conventionally reclaimed rubber and is suitable for premium radial tires. Chlorinated rubber is less susceptible to swelling by oils and may be used as paint ingredient.

**B80-10366**

### **REDUCED GRAVITY FAVORS COLUMNAR CRYSTAL GROWTH**

T. Z. KATTAMIS (Grumman Aerospace Corp.) and J. M. PAPAZIAN (Grumman Aerospace Corp.)

Jan. 1981

**M-FS-25205**

**Vol. 5, No. 3, p. 332**

In zero gravity, aligned columnar microstructures form at expense of equiaxed growth. Preferential crystal growth occurs in solidification chamber consisting of semicylindrical copper chill block brazed to stainless steel top plate. Method is best utilized in castings where directional dependence of physical properties is beneficial, as in turbine blades.

**B80-10489**

### **IMPROVED CELL FOR WATER-VAPOR ELECTROLYSIS**

J. R. AYLLWARD (United Technologies Corp.)

Apr. 1981

**MSC-16394**

**Vol. 5, No. 4, p. 447**

Continuous-flow electrolytic cells decompose water vapor in steam and room air into hydrogen and oxygen. Sintered iridium oxide catalytic anode coating yields dissociation rates hundredfold greater than those obtained using platinum black. Cell consists of two mirror-image cells, with dual cathode sandwiched between two anodes. Gas traverses serpentine channels within cell and is dissociated at anode. Oxygen mingles with gas stream, while hydrogen migrates through porous matrix and is liberated as gas at cathode.

**B80-10490****APPLYING THE HELIUM IONIZATION DETECTOR IN CHROMATOGRAPHY**

E. K. GIBSON, F. F. ANDRAWES (Lockheed Engineering and Management Services Co., Inc.), and R. S. BRAZELL (University of Houston)

Apr. 1981

**MSC-18835**

**Vol. 5, No. 4, p. 448**

High noise levels and oversensitivity of helium detector make flame-ionization and thermal-conductivity detectors more suitable for chromatography. Deficiencies are eliminated by modifying helium device to operate in saturation rather than multiplication mode. Result is low background current, low noise, high stability, and high sensitivity. Detector analyzes halocarbons, hydrocarbons, hydrogen cyanide, ammonia, and inorganics without requiring expensive research-grade helium.

**B80-10491****PHOTOPRODUCTION OF HALOGENS USING PLATINIZED TIO<sub>2</sub>**

B. REICHMAN (Christopher Newport College) and C. E. BYVIK

Apr. 1981

**LANGLEY-12713**

**Vol. 5, No. 4, p. 449**

Unlike electrolysis of halide salt solutions, technique using powdered titanium dioxide catalyst requires no external power other than ultraviolet radiation source. Semiconductor powders photocatalyze and photosynthesize many useful reactions; applications are production of halogen molecules, oxidation of hazardous materials in wastewater, and conversion of carbon monoxide to carbon dioxide.

**B80-10492****RECYCLING PAPER-PULP WASTE LIQUORS**

M. N. SARBOLOUKI (Caltech)

Apr. 1981

**NPO-14797**

**Vol. 5, No. 4, p. 450**

Papermills in U.S. annually produce 3 million tons of sulfite waste liquor solids; other fractions of waste liquor are monomeric sugars and lignosulfonates in solution. Recovery of lignosulfonates involves precipitation and cross-linking of sulfonates to form useful solid ion-exchange resin. Contamination of sugars recovered from liquor is avoided by first converting them to ethanol, then removing ethanol by distillation.

**B80-10493****USER CHOOSES COATING PROPERTIES**

C. S. GILLILAND and R. J. DUCKETT

Apr. 1981

**LANGLEY-12719**

**Vol. 5, No. 4, p. 451**

Anodizing technique allows independent selection of coating thermal emittance and solar absorption. Process has three phases: initial material processing, which prepares material and establishes initial values of emittance and absorption; anodizing with chromic acid solution, which determines final values; and material postprocessing. Stability tests show less than 15 percent coating degradation over 2,000 hour solar exposure.

**B80-10494****REMOVING FREON GAS FROM HYDRAULIC FLUID**

B. B. WILLIAMS (Rockwell International Corp.), S. M. MITCHELL (Rockwell International Corp.), and T. S. STATE (Rockwell International Corp.)

Apr. 1981

**MSC-18740**

**Vol. 5, No. 4, p. 452**

Dissolved freon gas is removed from hydraulic fluid by raising temperature to 150 F and bubbling dry nitrogen gas through it, even while fluid circulates through hydraulic system. Procedure reduces parts corrosion, sludge formation, and contamination.

**B80-10495****NEW PRESSURE-SENSITIVE SILICONE ADHESIVE**

J. L. LEIFFER, W. E. STOOPS, JR., T. L. ST. CLAIR, V. E. WATKINS, JR., and T. P. KELLY

Apr. 1981

**LANGLEY-12737**

**Vol. 5, No. 4, p. 452**

Adhesive for high or low temperatures does not stretch

severely under load. It is produced by combining intermediate-molecular-weight pressure sensitive adhesive which does not cure with silicone resin that cures with catalyst to rubbery tack-free state. Blend of silicone tackifier and cured rubbery silicone requires no solvents in either atmospheric or vacuum environments. Ratio of ingredients varies for different degrees of tack, creep resistance, and tensile strength.

**B80-10496****DRIVING BUBBLES OUT OF GLASS**

D. M. MATTOX (Westinghouse Electric Corp.)

Apr. 1981

**M-FS-25414**

**Vol. 5, No. 4, p. 453**

Surface tension gradient in melt forces gas bubbles to surface, increasing glass strength and transparency. Conventional chemical and buoyant fining are extremely slow in viscous glasses, but tension gradient method moves 250 um bubbles as rapidly as 30 um/s. Heat required for high temperature part of melt is furnished by stationary electrical or natural-gas heater; induction and laser heating are also possible. Method has many applications in industry processes.

**B80-10497****LESS-TOXIC CORROSION INHIBITORS**

T. S. HUMPHRIES

Apr. 1981 See also NASA-TP-1279(N78-28226)

**M-FS-25496**

**Vol. 5, No. 4, p. 453**

Combinations of borates, nitrates, phosphates, silicates, and sodium MBT protect aluminum from corrosion in fresh water. Most effective combinations contained sodium phosphate and were alkaline. These inhibitors replace toxic chromates which are subject to governmental restrictions, but must be used in larger quantities. Experimental exposure times varied from 1 to 14 months depending upon nature of submersion solution.

**B80-10498****DIFFUSION IN SINGLE-PHASE BINARY ALLOYS**

D. R. TENNEY and J. UNNAM (VPI and State University)

Apr. 1981

**LANGLEY-12665**

**Vol. 5, No. 4, p. 454**

DBAS 1 computer program provides analyst with simple algorithms for exact rapid solutions of systems with planar, cylindrical, or spherical interfaces. Conventional solutions are complex and present convergence problems. Two algorithm types are figured for each geometry; one converges rapidly for short and the other for long diffusion times. DBAS 1 is written in FORTRAN IV for batch execution.

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**B80-10072****TEMPERATURE CONTROLLER FOR HYPERTHERMIA DEVICES**

R. H. COUCH, C. P. HEARN, and J. B. WILLIAMS

Aug. 1980

**LANGLEY-12528**

**Vol. 5, No. 1, p. 59**

Temperature controller monitors and controls temperature in local region of tumor. Medical grade thermocouples are inserted in or near tumor, controller pulse modulates radio frequency diathermy power source to maintain temperature within 0.2 C. System may be extended to control diathermy of more than one tumor or patient.

**B80-10073****MEASURING WATER PROPERTIES FROM A MOVING BOAT**

A. G. LAWSON

Aug. 1980

**LANGLEY-12325**

**Vol. 5, No. 1, p. 60**

Modification of commercial water analyzer permits measure-

## 05 LIFE SCIENCES

ment of pH, temperature, dissolved oxygen, conductivity, and turbidity for continuous water flow. Ram pressure on inlet tube mounted below power boat drives water through modified sample chamber where it is analyzed.

### B80-10212

#### TESTING EKG ELECTRODES ON-LINE

W. G. CROSIER (Technol., Inc.) and G. S. RUTT (Technol., Inc.)  
Sep. 1980

MSC-18696

Vol. 5, No. 2, p. 187

Simple test instrument allows electrocardiograph operator to check individual electrodes while they are attached to subject. Simply by rotating switch and observing meter, operator verifies that each electrode is not short-circuited or open-circuited and does not present excessive contact resistance at its interface with skin. Instrument also makes it convenient to check electrode cables that are subject to frequent bending and wear, such as cables used on patients who are exercising.

### B80-10213

#### LASER-FLUORESCENCE MEASUREMENT OF MARINE ALGAE

E. V. BROWELL

Sep. 1980 See also NASA TND-8447(N77-26480)

LANGLEY-12282

Vol. 5, No. 2, p. 187

Progress in remote sensing of algae by laser-induced fluorescence is subject of comprehensive report. Existing single-wavelength and four-wavelength systems are reviewed, and new expression for power received by airborne sensor is derived. Result differs by as much as factor of 10 from those previously reported. Detailed error analysis evaluates factors affecting accuracy of laser-fluoresensor systems.

### B80-10367

#### FLOW SENSOR FOR BIOMEDICAL FLUIDS

H. E. WINKLER

Jan. 1981 See also B78-10267

MSC-18761

Vol. 5, No. 3, p. 335

Electronic sensor accurately measures and controls flow of plasma, whole blood, or drugs in solution. Since sensor does not directly contact fluid, it does not have to be sterilized. It is compatible with disposable bottles, tubes, and hypodermic needles widely used in hospitals. Only modification necessary is in tube, which must contain two small metal inserts, spaced to fit in curved thermistor plates.

### B80-10368

#### TREATING DOMESTIC WASTEWATER WITH WATER HYACINTHS

R. C. MCDONALD (Nat'l. Space Sci. Lab.) and B. C. WOLVERTON  
Jan. 1981

M-FS-23964

Vol. 5, No. 3, p. 336

Greenhouse system purifies water, extracts fertilizers, and generates fuels. When fully developed, system may supplant septic tanks and central sewage for rural and underdeveloped areas.

### B80-10369

#### COMPLIANT TRANSDUCER MEASURES ARTERY PROFILE

C. FELDSTEIN (Caltech), V. H. CULLER (Caltech), D. W. CRAWFORD (So. Calif. Univ.), and J. R. SPEARS (So. Calif. Univ.)

Jan. 1981

NPO-14899

Vol. 5, No. 3, p. 337

Instrument consisting of compliant fingers with attached semiconductor pickups measures inside contours of narrow vessels. Instrument, originally designed to monitor human arteries, is drawn through vessel to allow fingers to follow contours. Lead wires transmit electrical signals to external processing equipment.

### B80-10370

#### IMPROVED URETERAL STONE FRAGMENTATION CATHETER

P. M. GAMMELL (Caltech)

Jan. 1981

NPO-14745

Vol. 5, No. 3, p. 337

Catheter includes fiber optic viewer, more reliable ultrasonic

probe, and better contact sensor. It is guided by four steering wires, and irrigation fluid is supplied through lumen to remove stone fragments.

### B80-10371

#### MINIATURIZED PHYSIOLOGICAL DATA TELEMTRY SYSTEM

W. M. PORTNOY (Texas Tech. Univ.) and L. J. STOTTS (Texas Tech. Univ.)

Jan. 1981 See also NASA-CR-160660(N80-24357)

MSC-18804

Vol. 5, No. 3, p. 338

Portable digital physiological data telemetry system uses less power, is more compact, and provides better data integrity than two previous systems designed to similar specifications. It has 13 data channels and two-way voice communication.

### B80-10372

#### MANUAL FOR PHYSICAL FITNESS

A. E. COLEMAN (Univ. of Houston)

Jan. 1981 See also NASA-CR-160758(N80-29024)

MSC-18915

Vol. 5, No. 3, p. 339

Training manual used for preflight conditioning of NASA astronauts is written for audience with diverse backgrounds and interests. It suggests programs for various levels of fitness, including sample starter programs, safe progression schedules, and stretching exercises. Related information on equipment needs, environmental considerations, and precautions can help readers design safe and effective running programs.

### B80-10499

#### CARDIOPULMONARY DATA-ACQUISITION SYSTEM

W. G. CROSIER and R. A. REED

Apr. 1981 See also NASA-CR-160608(N80-33083); NASA-CR-160609(N80-33084); B80-10501

MSC-18783

Vol. 5, No. 4, p. 457

Computerized system controls and monitors bicycle and treadmill cardiovascular stress tests. It acquires and reduces stress data and displays heart rate, blood pressure, workload, respiratory rate, exhaled-gas composition, and other variables. Data are printed on hard-copy terminal every 30 seconds for quick operator response to patient. Ergometer workload is controlled in real time according to experimental protocol. Collected data are stored directly on tape in analog form and on floppy disks in digital form for later processing.

### B80-10500

#### MICROPROCESSOR-CONTROLLED ULTRASONIC PLETHYSMOGRAPH

P. K. BHAGAT (University of Kentucky) and V. C. WU (University of Kentucky)

Apr. 1981

MSC-18759

Vol. 5, No. 4, p. 458

Safe, noninvasive microprocessor system times ultrasonic pulses to measure limb cross-sectional area. Simple instrument requires no calibration and does not confine leg movement, making tests relating limb volume to activity level possible. Program considers more realistic geometries of human limb than circular cross-sections and monitors changes in area with great accuracy. Errors due to body temperature changes and timing roundoff are insignificant.

### B80-10501

#### MICROPROCESSOR-BASED CARDIOTACHOMETER

W. G. CROSIER (Technology, Inc.) and J. A. DONALDSON (Technology, Inc.)

Apr. 1981 See also NASA-CR-160607(N80-33082); B80-10499

MSC-18775

Vol. 5, No. 4, p. 459

Instrument operates reliably even with stress-test electrocardiogram (ECG) signals subject to noise, baseline wandering, and amplitude change. It records heart rate from preamplified, single-lead ECG input signal and produces digital and analog heart-rate outputs which are fed elsewhere. Analog hardware processes ECG input signal, producing 10-ms pulse for each heartbeat. Microprocessor analyzes resulting pulse train, identifying

irregular heartbeats and maintaining stable output during lead switching. Easily modified computer program provides analysis.

#### **B80-10502**

**IMPROVED MICROBE DETECTION IN WATER SAMPLES**  
J. R. WILKINS, D. C. GRANA, and S. C. FOX (The Bionetics Corp.)

Apr. 1981

**LANGLEY-12709**

Vol. 5, No. 4, p. 460

Method combines membrane filtration and electrochemical microbial detection. Together, techniques give fast response and accurate detection of low concentrations. Membrane filter placed on moistened absorbent pad collects cells; platinum-wire electrodes are positioned on filter surface. Second moistened pad is placed on top of electrodes and filter. Retainer ring maintains constant pressure and close contact between system components which are held in petri dish to reduce moisture loss.

#### **B80-10503**

**GAGE FOR EVALUATING RHEUMATOID HANDS**

J. C. HOUGE (University of Wisconsin) and K. A. PLAUTZ (University of Wisconsin)

Apr. 1981

**GSFC-12610**

Vol. 5, No. 4, p. 461

Two-axis goniometer accurately measures movements of fingers about knuckle joints, diagnosing hands structurally changed by rheumatoid arthritis. Instrument measures lateral movement which is small in normal knuckles but increased in diseased joints. Goniometer is two connected protractors that simultaneously measure angles in perpendicular planes. Dials are offset to clear bony protuberances; extension and offset adjustments span any hand size.

#### **B80-10504**

**FIBER-OPTICS COUPLE ARTHROSCOPE TO TV**

J. M. FRANKE and D. B. RHODES

Apr. 1981

**LANGLEY-12718**

Vol. 5, No. 4, p. 462

Convenient, hand-held coupler images output of arthroscope onto coherent fiber bundle. Arthroscope allows surgeons to examine internal organs through any small opening in body. Coupler is also used for engine inspection, instrument repair, and around-corner visual inspection. Image from arthroscope travels along flexible bundle and appears at other cable end where it is recollimated by lens. Image is read from lens or projected on color TV camera.

#### **B80-10505**

**BEEF GRADING BY ULTRASOUND**

P. M. GAMMELL (Caltech)

Apr. 1981

**NPO-14812**

Vol. 5, No. 4, p. 463

Reflections in ultrasonic A-scan signatures of beef carcasses indicate USDA grade. Since reflections from within muscle are determined primarily by fat/muscle interface, richness of signals is direct indication of degree of marbling and quality. Method replaces subjective sight and feel tests by individual graders and is applicable to grade analysis of live cattle.

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#### **B80-10074**

**CABLE-SPLICE DETECTOR**

R. D. LEE, E. J. IUFR, and A. GIOVANNETTI

Aug. 1980

**ARC-11291**

Vol. 5, No. 1, p. 63

Detector has possible uses in aerial cable-car systems, equipment handling in mines, boreholes, and undersea operations, and other applications where moving steel cable must be

measured, monitored, or controlled. Detector consists of Hall-effect magnetic sensor located close to cable. Magnetic markings on cable are converted to electrical signals. Signals are filtered, amplified, and can actuate alarm.

#### **B80-10075**

**LVDT GAGE FOR FRACTURE-TOUGHNESS TESTS IN LIQUID HYDROGEN**

W. S. PIERCE and J. L. SHANNON, JR.

Aug. 1980

**LEWIS-13038**

Vol. 5, No. 1, p. 64

Linear-variable differential transformer replaces conventional resistance strain gages to measure crack-mouth-opening displacement. LVDT is superior in tests under liquid hydrogen, where boiling of hydrogen on resistive is suited to broad temperature range and hostile environments such as nuclear reactors.

#### **B80-10076**

**TENSION-MODE LOADING FOR BEND SPECIMENS IN CRYOGENS**

W. S. PIERCE and J. L. SHANNON, JR.

Aug. 1980

**LEWIS-13040**

Vol. 5, No. 1, p. 65

Special fixture permits use of tension-loading apparatus in fracture-toughness tests on standard bend specimens. Specimen is held in place by spacer blocks and wire clips. Central, load-application roller bends specimen between lateral, reaction-load rollers.

#### **B80-10077**

**MODIFIED DISPLACEMENT GAGE FOR CRYOGENIC TESTING**

W. S. PIERCE

Aug. 1980 See also NASA-TN-D-3724 (N67-10749)

**LEWIS-13039**

Vol. 5, No. 1, p. 66

Modification of double-cantilever-beam resistance strain gage makes boiling of hydrogen on gage arms less of problem. Modified gages are encapsulated nickel/chromium alloy, and bridge-excitation voltage is reduced from 10 to 1.5 volts. Sensitivity is 1.0 millivolt per inch with 1.5 volt excitation.

#### **B80-10078**

**BROADBAND ELECTROSTATIC ACOUSTIC TRANSDUCER FOR LIQUIDS**

J. H. CANTRELL, JR. (National Research Council), J. S. HEYMAN, M. A. BREAZEALE (Univ. of Tennessee), M. A. TORBETT (Univ. of Tennessee), and W. T. YOST (Univ. of Tennessee)

Aug. 1980

**LANGLEY-12465**

Vol. 5, No. 1, p. 67

Capacitive electrostatic transducer (ESAT) measures absolute displacement amplitudes of ultrasonic waves in liquids, and may be used as calibrator for other transducers or as probe for nondestructive study and characterization of materials. ESAT consists of thin conductive membrane stretched over metallic housing. Ultrasonic waves incident on membrane cause it to vibrate and generate signal proportional to wave amplitude. Entire assembly is sealed for immersion in liquid.

#### **B80-10079**

**EDDY-CURRENT SENSOR MEASURES BOLT LOADING**

M. E. BURR (Rockwell International Corp.)

Aug. 1980

**M-FS-19486**

Vol. 5, No. 1, p. 68

Thin wire welded to bottom of hole down center of bolt permits measurement of tension in bolt. Bolt lengthens under strain, but wire is not loaded, so gap between wire and eddy-current gap transducer mounted on bolt head indicates bolt loading. Eddy-current transducer could measure gap within 0.05 mm. Method does not require separate 'standard' for each bolt type, and is not sensitive to dirt or oil in bolt hole, unlike ultrasonic probes.

#### **B80-10080**

**MULTIPLE-CREEP-TEST APPARATUS**

C. L. HAEHNER

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Aug. 1980

**GSFC-12561**

**Vol. 5, No. 1, p. 69**

Simplified, compact apparatus uses fixtures that can test three samples at once for flexure, compression, or double-shear creep. Each fixture uses series of rods and plates to divide one load equally among three samples. Fixtures could be expanded to carry more samples by adding more rods and plates.

**B80-10081**

**COMPACT, SUPER HEAT EXCHANGER**

A. FORTINI and J. M. KAZAROFF

Aug. 1980

**LEWIS-12441**

**Vol. 5, No. 1, p. 70**

Heat exchanger uses porous media to enhance heat transfer through walls of cooling channels, thereby lowering wall temperature. Porous media within cooling channel increases internal surface area from which heat can be transferred to coolant. Comparison data shows wall has lower temperature and coolant has higher temperature when porous medium is used within heat exchanger. Media can be sintered powdered metal, metal fibers, woven wire layers, or any porous metal having desired permeability and porosity.

**B80-10082**

**APPLICATIONS OF REMOTE-SENSING IMAGERY**

T. H. HUGHES (Univ. of Alabama)

Aug. 1980

**M-FS-25107**

**Vol. 5, No. 1, p. 71**

Compilation of reports discusses usefulness of aircraft and satellite data in land-development projects. Landsat and Earth Resources Technology Satellites data are available to general public. Much information on biological, geological, and hydrological features as well as land use can be determined by eye without sophisticated analyzers.

**B80-10083**

**EQUATIONS OF MOTION FOR COUPLED N-BODY SYSTEMS**

H. P. FRISCH

Aug. 1980

**GSFC-12407**

**Vol. 5, No. 1, p. 72**

Computer program, developed to analyze spacecraft attitude dynamics, can be applied to large class of problems involving objects that can be simplified into component parts. Systems of coupled rigid bodies, point masses, symmetric wheels, and elastically flexible bodies can be analyzed. Program derives complete set of non-linear equations of motion in vector/dyadic format. Numerical solutions may be printed out. Program is in FORTRAN IV for batch execution and has been implemented on IBM 360.

**B80-10084**

**VISCOUS CHARACTERISTICS ANALYSIS**

R. V. JENKINS

Aug. 1980

**LANGLEY-12598**

**Vol. 5, No. 1, p. 72**

Program considers combustion and diffusive effects in analysis of supersonic, combustion-flow fields with imbedded subsonic regions. Effects of finite-rate chemistry, mixing, and wave propagation are linked together. Program handles up to 20 simultaneous shock waves. Some chemistry terms are computed for seven-species, eight-mechanism, hydrogen-and-air reaction scheme. Program is aid for supersonic-combustor development studies and is written in FORTRAN IV for batch execution on CYBER 175.

**B80-10085**

**TRANSONIC AIRFOIL DESIGN CODE**

F. BAUER (New York Univ.), P. GARABEDIAN (New York Univ.), and D. KORN (New York Univ.)

Aug. 1980

**LANGLEY-12460**

**Vol. 5, No. 1, p. 73**

Program aids in design of shockless airfoils, assists development of fuel-conserving, supercritical wings. Algorithm calculates approximate airfoil shape given prescribed pressure distribution. This allows design of families of transonic airfoils

for use in aircraft wings or turbine and compressor blades. Program is written in FORTRAN IV for batch execution on CDC-6000.

**B80-10086**

**IMPROVED MULTIELEMENT AIRFOIL ANALYSIS**

G. W. BRUNE (The Boeing Co.) and J. W. MANKE (The Boeing Co.)

Aug. 1980

**LANGLEY-12489**

**Vol. 5, No. 1, p. 73**

Program is revised of NASA/Lockheed program to numerically analyze complex viscous flow about slotted airfoils. Airfoil to be analyzed can contain as many as 10 components with negative or positive overlap. Program is written in FORTRAN IV and Assembled for batch execution on CYBER 175 only.

**B80-10087**

**AIRCRAFT EQUILIBRIUM SPIN CHARACTERISTICS**

W. M. ADAMS, JR.

Aug. 1980

**LANGLEY-12502**

**Vol. 5, No. 1, p. 74**

Program provides analytic solutions to nonlinear equations of motion describing spin conditions. Stability characteristics also are determined. Program can be used to study effects of aerodynamic and inertial parameters on spin and could be modified to compute equilibrium conditions for steady maneuvers. Program is written in FORTRAN IV for batch execution on CYBER 173.

**B80-10088**

**FLOW FIELD IN SUPERSONIC MIXED-COMPRESSION INLETS**

A. R. BISHOP, J. D. HOFFMAN (Purdue Univ.), and J. VADYAK (Purdue Univ.)

Aug. 1980

**LEWIS-13279**

**Vol. 5, No. 1, p. 74**

Program uses method of characteristics for steady three-dimensional flow to calculate flow field in supersonic portion of mixed-compression aircraft inlet at non-zero angle of attack. Results agree well with experimental data except in regions of high viscous interaction. Flow field for variety of mixed-compression inlets can be calculated. Input includes geometry and attack of inlet. Output consists of list of parameters, solution planes, and description of shock waves. Program is written in FORTRAN IV for batch execution on CDC 6000-series.

**B80-10089**

**SHELL THEORY AUTOMATED FOR ROTATIONAL STRUCTURES**

J. KEY, V. S. GONAS (Grumman Aerospace Corp.), S. LEVINE (Grumman Aerospace Corp.), and P. OGILVIE (Grumman Aerospace Corp.)

Aug. 1980

**M-FS-23027**

**Vol. 5, No. 1, p. 74**

Package of numerical integration programs static, buckling, vibration, and plastic analysis on thin shells of revolution. Shells may be subjected to distributed loads, concentrated line loads, and thermal strain. Outputs include stresses, displacement, plastic strains, and vibration and buckling results. Program aids design of aircraft bodies, spacecraft, submarines, and storage tanks. Written in FORTRAN IV for batch execution, program has been implemented on UNIVAC 1108.

**B80-10090**

**THREE-DIMENSIONAL POTENTIAL FLOW**

N. D. HALSEY (McDonnell Douglas Corp.) and J. L. HESS (McDonnell Douglas Corp.)

Aug. 1980 See also NASA-TM-80088 (N79-31142)

**LANGLEY-12623**

**Vol. 5, No. 1, p. 75**

Program calculates viscous effects on lift and pressure distribution for arbitrary-dimensional lifting configuration. Geometry package generates input data from reduced amount of user-supplied configuration data. Calculated inviscid and viscous lift and pressure distribution agree well with experimental data for variety of wings and wing/fuselages. Program is in FORTRAN IV for batch execution on CYBER 175.

**B80-10091****FULL-COVERAGE FILM COOLING**P. L. MEITNER (U.S. Army Research and Technology Laboratories)  
Aug. 1980**LEWIS-13249****Vol. 5, No. 1, p. 75**

Program calculates coolant flow and wall temperatures of full-coverage film-cooled vanes or blades. Thermal barrier coatings may be specified on outer surfaces of blade. Program is written in FORTRAN IV for batch execution on UNIVAC 1100.

**B80-10092****DISTURBANCE AMPLIFICATION RATES**A. J. SROKOWSKI, S. A. ORSZAG (Cambridge Hydrodynamics, Inc.), T. CEBECH (McDonnell Douglas), and K. KAUPS (McDonnell Douglas Corp.)  
Aug. 1980**LANGLEY-12556****Vol. 5, No. 1, p. 76**

Program computes incompressible linear stability characteristics for swept and tapered wings. Amplification rates of boundary-layer disturbances also are calculated. Program is useful in designing tapered, laminar-flow control wings incorporating suction to prevent boundary layer separation. Program is written in FORTRAN IV and Assembler for batch execution on CYBER 70-series.

**B80-10214****AUTOMATIC THERMAL SWITCHES**

J. W. CUNNINGHAM and L. D. WING

Sep. 1980

**GSFC-12553****Vol. 5, No. 2, p. 191**

Two automatic switches control heat flow from one thermally conductive plate to another. One switch permits heat flow to outside; other limits heat flow. In one switch, heat on conductive plate activates piston that forces saddle against plate. Heat carriers then conduct heat to second plate that radiates it away. After temperature is first plate drops, piston contracts and spring breaks thermal contact with plate. In second switch, action is reversed.

**B80-10215****GROOVES REDUCE AIRCRAFT DRAG**

M. J. WALSH

Sep. 1980

**LANGLEY-12599****Vol. 5, No. 2, p. 192**

Aerodynamic drag can be reduced by many small longitudinal grooves machined in aircraft skin. Experiments show that grooves parallel to airflow reduce drag by 4 to 7 percent. Reduced drag translates into reduced engine power required to overcome drag and ultimately to lower fuel consumption.

**B80-10216****EFFICIENT MEASUREMENT OF SHEAR PROPERTIES OF FIBER COMPOSITES**

C. C. CHAMIS and J. H. SINCLAIR

Sep. 1980 See also NASA-TN-D-8215(N76-22314)

**LEWIS-13011****Vol. 5, No. 2, p. 193**

Intralaminar (in-plane) shear characterization (shear stress/strain relationships) of unidirectional fiber composites has been hampered by difficulty of producing state of pure shear in practical laboratory test specimens. Proposed method uses 10 deg off-axis tensile specimen (fiber oriented 10 deg from load direction) in conjunction with simple transformation equations for intralaminar shear characterization of fiber composites.

**B80-10217****FRESNEL LENSES FOR ULTRASONIC INSPECTION**

C. C. KAMMERER (Rockwell Intern. Corp.)

Sep. 1980

**MSC-18469****Vol. 5, No. 2, p. 194**

Ultrasonic Fresnel lenses are effective focusing elements with potential applications in ultrasonic 'contact' testing for defects in materials. Ultrasonic beams focused on concave lenses are used successfully with immersion transducers, for which test object is immersed in water bath. However, for large objects, objects that are already installed, objects on production lines, and objects that can be damaged by water, contact testing is more practical than immersion.

**B80-10218****CHANGES IN 'THERMAL LENS' MEASURE DIFFUSIVITY**

A. GUPTA (Caltech), S. D. HONG (Caltech), and J. MOACANIN (Caltech)

Sep. 1980

**NPO-14857****Vol. 5, No. 2, p. 194**

In an extension of 'thermal lens' effect to new applications and better resolution, two laser beams combine to rapidly measure thermal diffusivity and other molecular dynamic properties. New double-beam technique handles very small samples unlike classical techniques for measuring diffusivity. It can be used for measurements on samples undergoing stress, making it applicable to data collection for structural engineering.

**B80-10219****PASSIVE WING/STORE FLUTTER SUPPRESSION**

J. T. FOUGHNER, JR., W. H. REED, III, and H. L. RUNYAN, JR. (George Washington Univ.)

Sep. 1980

**LANGLEY-12468****Vol. 5, No. 2, p. 195**

Passive flutter-suppression system has been developed to increase flutter speed of aircraft wings that are adversely affected by addition of large masses (stores) to the wings, such as external fuel tanks. Important features of system are its effectiveness for large variations in mass of store as well as unsensitivity of system to large change in location of store center-of-gravity.

**B80-10220****SUPPRESSING BUZZ-SAW NOISE IN JET ENGINES**

L. MAESTRELLO

Sep. 1980 See also NASA-TM-78802(N79-13820)

**LANGLEY-12645****Vol. 5, No. 2, p. 196**

Buzz-saw noise, most annoying noise component generated by turbofan engines, can be suppressed by installing porous surface on duct wall directly above engine fan-blade tip. Porous surface and its housing would reduce shock-wave reflection from wall and thus suppress noise.

**B80-10221****DETECTION OF TANKER DEFECTS WITH INFRARED THERMOGRAPHY**

A. G. KANTSIOS

Sep. 1980

**LANGLEY-12655****Vol. 5, No. 2, p. 196**

Infrared scanning technique for finding defects in secondary barrier of liquid natural gas (LNG) tank has been successfully tested on ship under construction at Newport News Shipbuilding and Dry Dock Company. Technique determines defects with minimal expenditure of time and manpower. Tests could be repeated during life of tanker and make more complicated testing unnecessary. Tests also confirmed that tank did not have any major defects, and tank was certified.

**B80-10222****RECORDING FLUID CURRENTS BY HOLOGRAPHY**

L. O. HEFLINGER (TRW, Inc.) and R. F. WUERKER (TRW, Inc.)

Sep. 1980

**M-FS-25373****Vol. 5, No. 2, p. 198**

Convection in fluids can be studied with aid of holographic apparatus that reveals three-dimensional motion of liquid. Apparatus eliminates images of fixed particles such as dust on windows and lenses, which might mask behavior of moving fluid particles. Holographic apparatus was developed for experiments on fluid convection cells under zero gravity. Principle is adaptable to study of variety of fluid processes—for example, electrochemical plating and combustion in automotive engines.

**B80-10223****DOWNHOLE PRESSURE SENSOR**

C. M. BERDAHL (Caltech)

Sep. 1980

**NPO-14729****Vol. 5, No. 2, p. 199**

Sensor remains accurate in spite of varying temperatures. Very accurate, sensitive, and stable downhole pressure measurements are needed for variety of reservoir engineering applica-

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tions, such as deep petroleum reservoirs, especially gas reservoirs, and in areas of high geothermal gradient.

### B80-10224

#### OCEANIC-WAVE-MEASUREMENT SYSTEM

J. F. HOLMES (Computer Sci. Corp.) and R. T. MILES (Computer Sci. Corp.)

Sep. 1980

M-FS-23862

Vol. 5, No. 2, p. 200

Barometer mounted on bouy senses wave heights. As wave motion raises and lowers barometer, pressure differential is proportional to wave height. Monitoring circuit samples barometer output every half cycle of wave motion and adds magnitudes of adjacent positive and negative peaks. Resulting output signals, proportional to wave height, are transmitted to central monitoring station.

### B80-10225

#### ELECTROFLUIDIC ACCELEROMETER

D. E. HEWES

Sep. 1980

LANGLEY-12493

Vol. 5, No. 2, p. 201

Electrofluidic accelerometer senses components of linear and angular acceleration field. Typical application of such acceleration is as active controlling element in airplane autopilot. In contrast to conventional accelerometers, electrofluidic accelerometer is lightweight, small, inexpensive, rugged, and requires little power. It consists of two temperature sensors on opposite sides of heating element. Sensors detect temperature gradient created by acceleration field on fluid; when device is accelerated, gradient changes because of bouyant force on hotter (thus lighter) portion of fluid.

### B80-10226

#### FLASHBACK-FREE COMBUSTOR

S. G. ANDERSON and N. T. WAKELYN

Sep. 1980 See also NASA-TP-1472(N79-28259)

LANGLEY-12666

Vol. 5, No. 2, p. 202

All zirconia combustion chamber for testing fuels prevents 'flashback' accidental extension of flame into fuel supply line. Chamber consists of hemispherical injector on base surrounded by hemispherical cap. Cap has two additional ports for thermocouple and gas sampling probes.

### B80-10227

#### MEASURING RADIATION EFFECTS ON MOS CAPACITORS

M. BAKOWSKI (Caltech), R. H. COCKRUM (Caltech), J. MASERJIAN (Caltech), and N. ZAMANI (Caltech)

Sep. 1980

NPO-14700

Vol. 5, No. 2, p. 203

Electron injection technique serves as powerful probe of trapped hole distribution after irradiation because it was determined that electrons only annihilate trapped holes. Other effects, such as other electron traps and interface state generation, are negligible in injection range used. Trap cross sections and densities indicate at least three trap species: interfacial species, dominant bulk species determined to tail off from silicon interface, and lower density and cross section species that may be distributed throughout bulk of oxide.

### B80-10228

#### PREDICTING LIFETIME OF CAST PARTS

R. A. COOPER (Rockwell International Corp.)

Sep. 1980

M-FS-19549

Vol. 5, No. 2, p. 204

Life expectancy of cast aluminum machine parts can be predicted accurately from fatigue tests at 78 K on notched specimens of aluminum alloy. Method was developed for rocket engine turbopump parts made of high strength, heat treatable alloy with high silicon content; however, technique is applicable to other aluminum casting alloys.

### B80-10229

#### DETECTING CONTAMINANTS BY ULTRAVIOLET PHOTOG- RAPHY

D. W. NEISWANDER (Martin Marietta Corp.)

Sep. 1980

M-FS-25296

Vol. 5, No. 2, p. 205

Relatively high ultraviolet absorptivity of most organics as compared to metal is suggested as basis for detecting traces of contamination. By photographing metal surface in ultraviolet light, contaminants that might otherwise interfere with adhesion of surface coatings, or with welding or brazing, could be detected and removed. Real time monitoring of cleaning process is also possible if ultraviolet sensitive television camera is used instead of photographic film.

### B80-10230

#### DETECTING SURFACE FAULTS ON SOLAR MIRRORS

M. J. ARGOU (Caltech), M. S. SHUMATE (Caltech), W. L. WALKER (Caltech), and R. A. ZANTESON (Caltech)

Sep. 1980

NPO-14684

Vol. 5, No. 2, p. 205

Two quality control tests determine reflectivity and curvature faults of concave solar mirrors. Curvature defects in solar mirrors are easily revealed by photographing mirror surface. Calibrated aperture placed in front of camera lens admits rays reflecting only from acceptable areas of mirror, blocking out diverging rays reflected from defective areas. Defects can pinpoint problems that may exist in production. Same photograph can be obtained using calibrated disk instead of aperture, except that, this time, only defective areas would be exposed.

### B80-10231

#### REFRACTION CORRECTIONS FOR SURVEYING

W. M. LEAR (TRW, Inc.)

Sep. 1980 See also TM-80803(N80-10907)

MSC-18664

Vol. 5, No. 2, p. 206

Optical measurements of range and elevation angles are distorted by refraction of Earth's atmosphere. Theoretical discussion of effect, along with equations for determining exact range and elevation corrections, is presented in report. Potentially useful in optical site surveying and related applications, analysis is easily programmed on pocket calculator. Input to equation is measured range and measured elevation; output is true range and true elevation.

### B80-10232

#### DIGITAL ENHANCEMENT OF X-RAYS FOR NDT

R. L. BUTTERFIELD

Sep. 1980

KSC-11118

Vol. 5, No. 2, p. 206

Report is 'cookbook' for digital processing of industrial X-rays. Computer techniques, previously used primarily in laboratory and developmental research, have been outlined and codified into step by step procedures for enhancing X-ray images. Those involved in nondestructive testing should find report valuable asset, particularly is visual inspection is method currently used to process X-ray images.

### B80-10233

#### DESIGN CONSIDERATIONS FOR MECHANICAL FACE SEALS

L. P. LUDWIG and H. F. GREINER (Sealol, Inc.)

Sep. 1980 See also NASA-TM-73735(N78-13439); NASA-TM-73736(N77-33518)

LEWIS-13146

Vol. 5, No. 2, p. 207

Two companion reports deal with design considerations for improving performance of mechanical face seals, one of family of devices used in general area of fluid sealing of rotating shafts. One report deals with basic seal configuration and other with lubrication of seal.

### B80-10234

#### REGENERATIVE SUPERHEATED STEAM TURBINE CYCLES

L. C. FULLER (Union Carbide Corp.) and T. K. STOVALL (Union Carbide Corp.)

Sep. 1980

LEWIS-13392

Vol. 5, No. 2, p. 208

PRESTO computer program was developed to analyze performance of wide range of steam turbine cycles with special attention given to regenerative superheated steam turbine cycles.



It can be used to model standard turbine cycles, including such features as process steam extraction, induction and feedwater heating by external sources, peaking, and high back pressure. Expansion line efficiencies, exhaust loss, leakages, mechanical losses, and generator losses are used to calculate cycle heat rate and generator output. Program provides power engineer with flexible aid for design and analysis of steam turbine systems.

**B80-10235****STREAM TUBE CURVATURE ANALYSIS**

D. R. FERGUSON (GE) and J. S. KEITH (GE)

Sep. 1980

**LANGLEY-11535**

Vol. 5, No. 2, p. 208

Program accurately calculates inviscid pressure distribution and flow field, including viscous displacement effects, around arbitrary axisymmetric ducted body at transonic speeds. Computerized flow field analysis predicts transonic flow around long and short high bypass ratio fan duct nacelles with inlet and outlet flows having appropriate aerothermodynamic properties. It makes possible parametric studies for evaluating nacelle design criteria and selecting configurations for further experimental investigations.

**B80-10236****A GENERALIZED VORTEX LATTICE METHOD**

W. M. BAKER (Lockheed Aircraft Corp.), R. D. ELLIOTT (Lockheed Aircraft Corp.), and L. R. MIRANDA (Lockheed Aircraft Corp.)

Sep. 1980

**LANGLEY-12636**

Vol. 5, No. 2, p. 209

Several variations of vortex lattice method that are currently available have proved practical and versatile theoretical tools for aerodynamic analysis and design of planar and nonplanar configurations. Success of method is due in great part to relative simplicity of numerical technique involved and to accuracy of results obtained; however, most of available procedures are for subsonic flow applications. VORLAX program was developed to incorporate direct extension of vortex lattice method into supersonic flow regime, thus providing analyst with full flow range capability.

**B80-10237****VIBRATION MODES AND FREQUENCIES OF STRUCTURES**

R. J. DURLING and R. G. KVATERNIK

Sep. 1980

**LANGLEY-12647**

Vol. 5, No. 2, p. 209

SUDAN, Substructuring in Direct Analysis, analyzes natural modes and frequencies of vibration of structural systems. Based on direct method of analysis that employs substructures methodology, program is used with structures that may be represented as equivalent system of beam, springs, and rigid bodies.

**B80-10238****PREDICTING PROPULSION SYSTEM DRAG**

L. E. PUTNAM

Sep. 1980

**LANGLEY-12619**

Vol. 5, No. 2, p. 210

DONBOL computer program analytically predicts axisymmetric nozzle afterbody pressure distributions and drag. Predictions are based on Neumann solution for inviscid external flow coupled with modified Reshotko-Tucker integral boundary layer technique, control volume method of Presz for calculating flow in separated region, and inviscid one dimensional solution for jet exhaust flow. Comparisons with experimental data indicate program accurately predicts pressure distributions of boattail afterbodies for which jet exhaust plume can be simulated by solid body. For other configurations, nozzle pressure drag seems to be significantly underpredicted. Method is limited to subsonic free stream mach numbers below those for which flow over body becomes sonic.

**B80-10239****HEAT CONDUCTION IN THREE DIMENSIONS**

T. M. DANZA (Rockwell Intern. Corp.), L. W. FESLER (Rockwell Intern. Corp.), and R. D. MONGAN (Rockwell Intern. Corp.)

Sep. 1980

**MSC-18616**

Vol. 5, No. 2, p. 210

Multidimensional heat conduction program computes transient temperature history and steady state temperatures of complex body geometries in three dimensions. Emphasis is placed on type of problems associated with Space Shuttle thermal protection system, but program could be used in thermal analysis of most three dimensional systems.

**B80-10373****HOLES HELP CONTROL TEMPERATURE**

C. K. CHHATPAR (RCA Corp.)

Jan. 1981

**GSFC-12618**

Vol. 5, No. 3, p. 343

Study of passive thermal control for the Solar Terrestrial Subsatellite (STSS) has found that array of 'see through' holes substantially improves performance of system. Holes in payload mounting plates allow line of sight radiative heat transfer between hot and cold ends of spacecraft and between mounting plates and ends. Temperature gradients between plates are thereby reduced, as is temperature of each plate. Holes and selected exterior paints and finishes keep payload cool for all orientations and operating modes of STSS.

**B80-10374****FAST RESPONSE CRYOGEN LEVEL SENSOR**

J. B. FITZPATRICK (Simmonds Precision Products, Inc.) and L. C. MAIER (Simmonds Precision Products, Inc.)

Jan. 1981

**MSC-18697**

Vol. 5, No. 3, p. 344

Liquid level in cryogenic tank or pipe, or amount of gas trapped in pipeline flow, is monitored electronically by cylindrical capacitive sensor. Changes in liquid level between concentric tubes of capacitor change its impedance, varying current in drive circuit. Since it is oriented parallel to direction of liquid flow, sensor presents little resistance to moving fluid.

**B80-10375****FIBER OPTIC LEVEL SENSOR FOR CRYOGENS**

M. SHARMA (TRW, Inc.)

Jan. 1981

**MSC-18674**

Vol. 5, No. 3, p. 345

Sensor is useful in cryogenic environments where liquids of very low index of refraction are encountered. It is 'yes/no' indication of whether liquid is in contact with sensor. Sharp bends in fiber alter distribution of light among propagation modes. This amplifies change in light output observed when sensor contacts liquid, without requiring long fiber that would increase insertion loss.

**B80-10376****ACOUSTIC LENS IS GAS-FILLED**

J. M. KENDALL, JR. (Caltech)

Jan. 1981

**NPO-14757**

Vol. 5, No. 3, p. 345

Fluorocarbon gas contained by plastic membrane is effective lens for sound waves. In tests, lens substantially improved accuracy of sound 'maps' of turbulent airflow. It could also be used to record sound intensity patterns in design of speakers, lecture halls, and auditoriums. Lens is fabricated by clamping together two membranes of thin plastic and filling enclosed space with fluorocarbon gas. Since speed of sound in gas is considerably less than in air, lens refracts and focuses sound waves, analogous to focusing light by glass lens. Focal length is adjusted simply by changing gas pressure, which changes lens curvature.

**B80-10377****ULTRASONIC FREQUENCY ANALYSIS**

J. H. CANTRELL, JR. and J. S. HEYMAN

Jan. 1981

**LANGLEY-12697**

Vol. 5, No. 3, p. 346

Technique is used for evaluation and characterization of materials, fluids, and biological tissue. Method eliminates problem of electrical drive pulse shape by slaving tracking generator to local oscillator of spectrum analyzer. Logic/timing generator is used to control pulse transmission and receiving sequence, pulse width, and pulse repetition rate.

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### B80-10378 TEMPERATURE CONTROLLER ADAPTS TO FATIGUE TESTER

L. A. IMIG and M. R. GARDNER  
Jan. 1981

**LANGLEY-12393** Vol. 5, No. 3, p. 347  
Identical blocks of aluminum, held against front and back of specimen, each contain electrical heaters, liquid nitrogen cavity with input and exhaust tubes, and thermocouple. Thermocouples are connected to control unit, which adjusts specimen temperature during fatigue tests over range of 850 degrees F.

### B80-10379 ENVIRONMENTAL TESTING UNDER LOAD

R. K. CLARK and W. B. LISAGOR  
Jan. 1981

**LANGLEY-12602** Vol. 5, No. 3, p. 348  
Inexpensive fixture applies compression loads to specimens exposed to environment. Fixture handles relatively large specimens suitable for postexposure analysis of physical, chemical, and mechanical properties.

### B80-10380 TESTING PANELS IN TENSION AND FLEXURE

G. K. JING (Martin Marietta Corp.)  
Jan. 1981

**M-FS-25421** Vol. 5, No. 3, p. 349  
Simple jig adapts tensile test machine for simultaneous application of tension and flexure, for evaluating panel composition, processing, and design. Environmental test chamber can be added so that panel properties can be measured at extreme temperatures.

### B80-10381 A CONSTRUCTION TECHNIQUE FOR WIND TUNNEL MODELS

P. L. LAWING, P. G. SANDEFUR, JR., and W. H. WOOD  
Jan. 1981

**LANGLEY-12710** Vol. 5, No. 3, p. 350  
High strength, good surface finish, and corrosion resistance are imparted to miniature wind tunnel models by machining pressure channels as integral part of model. Pattern for pressure channels is scribed, machined, or photoetched before channels are drilled. Mating surfaces for channels are flashed and then diffusion brazed together.

### B80-10382 MEASURING THE THERMAL CONDUCTIVITY OF INSULATION

C. A. WILKINS (Caltech), R. ASH (Caltech), and W. L. DOWLER (Caltech)  
Jan. 1981

**NPO-14871** Vol. 5, No. 3, p. 351  
Two symmetrical heat sources help determine thermal transmission properties of insulating material.

### B80-10383 RAIN, FOG, AND CLOUDS FOR AIRCRAFT SIMULATORS

W. D. CHASE  
Jan. 1981

**ARC-11158** Vol. 5, No. 3, p. 352  
Environmental chamber creates realistic fog and rain effects in aircraft simulator. It reproduces clouds, homogeneous fog, patches of fog, rain and fog, and rain only. It is used with real time digital computer, color computer generated image display that simulates airport lights, or color television camera that produces moving display of airport runway as depicted on model terrain board.

### B80-10384 IMPROVED MAGNETIC MATERIAL ANALYZER

J. E. TRINER  
Jan. 1981 See also NASA-TM-79234 (N79-31499)

**LEWIS-13493** Vol. 5, No. 3, p. 353  
Flux-controlled magnetic-core-loss tester has been developed that produces high-frequency core-loss data (within 2 percent)

for any desired waveform excitation and allows magnetic characteristics of material to be measured under symmetrical and asymmetrical excitation conditions. It allows direct control of additional loss variable rather than just driving frequency as is case for all previous sinusoidal core-loss measurements.

### B80-10385 ELECTRONIC DEPTH MICROMETER

R. K. MAJOR (United Space Boosters, Inc.)  
Jan. 1981

**KSC-11181** Vol. 5, No. 2, p. 354

Device for measuring depth or thickness reads distance of penetration by small-diameter probe. It was developed specifically to measure thickness of wet (uncured) insulation applied to Space Shuttle structures; thin probes penetrate wet insulation to substrate, and reference surface on gage is then positioned against outer surface of insulation to measure its thickness. Gage is easy to use, even by workers wearing gloves or other protective clothing, and allows remote reading and recording of production data.

### B80-10386 INTERCHANGEABLE SPRING MODULES FOR INERTIA MEASUREMENTS

J. W. MCNAMARA and J. W. OAKLEY  
Jan. 1981

**LANGLEY-12402** Vol. 5, No. 3, p. 355

Operation of inertia balance is simplified by packaging set of balance springs in interchangeable modules. They are held in place in balance pedestal by just two fasteners, making removal and replacement fast and simple. With them, balance can be readied in less than 15 minutes, in contrast to more than 2 hours by previous method.

### B80-10387 WAKEFLOW ANALYSIS BY COST

V. J. ANSELMO (Caltech)  
Jan. 1981

**NPO-14705** Vol. 5, No. 3, p. 355

COST (Computerized Optical Scanning Tomography) is proposed for visualizing wakeflows of aircraft and wind-tunnel models. Operating very close to real time, COST hardware could be installed at airports to monitor turbulent flow trailing large aircraft, so that smaller aircraft could be directed to avoid turbulence. Real-time analysis of jet-engine exhaust plumes, to reduce pollution and optimize performance, is also possible.

### B80-10388 INTEGRATED MATERIAL-SURFACE ANALYZER

F. J. GRUNTHANER (Caltech) and B. F. LEWIS (Caltech)  
Jan. 1981

**NPO-14702** Vol. 5, No. 3, p. 356

These 10 surface-analysis tests can be run without breaking vacuum: secondary-ion mass spectroscopy, ion-scattering spectroscopy, electron-stimulated desorption, residual-gas analysis, auger electron spectroscopy, x-ray photoelectron spectroscopy, ultraviolet photoelectron spectroscopy, characteristic-electron energy-loss spectroscopy, scanning electron microscope, scanning low-energy electron probe. Quadruple mass spectrometer, used in first 4 tests, serves as electron transfer lens in last 6 tests.

### B80-10389 FIBER OPTIC ACCELEROMETER

R. R. AUGUST (Rockwell Intern. Corp.)  
Jan. 1981

**LEWIS-13219** Vol. 5, No. 3, p. 357

Low-cost, rugged lightweight accelerometer has been developed that converts mechanical motion into digitized optical outputs and is immune to electromagnetic and electrostatic interferences. Instrument can be placed in hostile environment, such as engine under test, and output led out through miscellany of electrical fields, high temperatures, etc., by optic fiber cables to benign environment of test panel. There, digitized optical signals can be converted to electrical signals for use in standard

electrical equipment or used directly in optical devices, such as optical digital computer.

#### B80-10390

##### HEAT/PRESSURE SEAL FOR MOVING PARTS

M. L. STEVENS (Fairchild Republic Co.)

Jan. 1981

MSC-18422

Vol. 5, No. 3, p. 358

Prototype seal keeps hot gases from leaking between large, adjacent parts in relative motion. Seal withstands temperatures greater than 1,000 degrees C (1800 degrees F) and accommodates heat and pressure caused distortion of parts. It is nonabrasive, creates little resistance to movement of parts, and causes minimal wear and damage to surface coatings.

#### B80-10391

##### HEAT SWITCH HAS NO MOVING PARTS

S. H. CASTLES

Jan. 1981

GSFC-12625

Vol. 5, No. 3, p. 359

No moving parts are needed for thermally actuated switch. It could also operate as variable thermal conductance, allowing temperature of equipment to be regulated with minimal expenditure of energy.

#### B80-10392

##### DYNAMICS OF CAVITATING CASCADES AND INDUCER PUMPS

C. E. BRENNEN (California Inst. of Tech.) and A. J. ACOSTA (California Inst. of Tech.)

Jan. 1981

M-FS-25399

Vol. 5, No. 3, p. 359

Report chronicles advances in understanding and predicting unsteady dynamic characteristics of cavitating cascades and inducer pumps. It includes bibliography of 19 papers authored between 1972 and 1980.

#### B80-10393

##### SIMPLIFIED THERMAL ANALYZER

M. J. COYLE

Jan. 1981

GSFC-12638

Vol. 5, No. 3, p. 360

Simplified Shuttle Payload Thermal Analyzer (SSPTA) aids in evaluating thermal design of instruments to be flown in Space Shuttle cargo bay. It is collection of programs that are currently used in thermal analysis of spacecraft, modified for quick, preliminary analysis of payloads. Although designed primarily to analyze Shuttle payloads, it can be easily used for thermal analysis in other situations.

#### B80-10394

##### RESIZING STRUCTURES FOR MINIMUM WEIGHT

C. FLEURY and L. A. SCHMIT (California Univ.)

Jan. 1981

LANGLEY-12699

Vol. 5, No. 3, p. 361

Approximation concepts and dual-method algorithms are combined in method of minimum-weight design for structures. Approximation Concepts Code for Efficient Structural Synthesis (ACCESS3) program is powerful research tool in which mathematical programming and optimality criteria are coalesced in efficient structural weight-minimization method.

#### B80-10395

##### NASTRAN MODIFICATIONS FOR RECOVERING STRAINS AND CURVATURES

C. C. CHAMIS and C. H. HENNRICH (MacNeal-Schwendler Corp.)

Jan. 1981

LEWIS-12592

Vol. 5, No. 3, p. 361

NASTRAN, NASA's general-purpose finite-element structural analysis program, has been modified to allow recovery of surface strains, reference plane strains, and local curvatures at nodes of general plane elements. NASTRAN routines that operate on element stress/strain/temperature relationships and strain/temperature relationships have been modified to incorporate generation and return of strains and curvatures in lieu of stresses. Strains and curvatures are then transformed to material axes

and interpolated to generate corresponding strains and curvatures at nodes of element. This interpolation is accomplished using special surface-mapping function.

#### B80-10396

##### COST-MINIMIZED AIRCRAFT TRAJECTORIES

H. LEE and H. ERZBERGER

Jan. 1981

ARC-11282

Vol. 5, No. 3, p. 361

For aircraft operating over fixed range, operating costs are basically sum of fuel cost and time cost; but determining minimum cost trajectory can be complex. Program optimizes trajectories with respect to cost function that is based on weighed sum of fuel cost and time cost. Minimum fuel, minimum time, and various delay trajectories are obtained by specifying particular values for fuel and time cost factors.

#### B80-10397

##### AERODYNAMIC PRELIMINARY ANALYSIS

E. BONNER (Rockwell International Corp.), W. CLEVER (Rockwell International Corp.), P. DIVAN (Rockwell International Corp.), K. DUNN (Rockwell International Corp.), and J. KOJIMA (Rockwell International Corp.)

Jan. 1981

LANGLEY-12404

Vol. 5, No. 3, p. 362

Computerization of aerodynamic theory has progressed to state where analysis of complete aircraft configurations can be performed in single program. Aerodynamic Preliminary Analysis System, APAS, is comprehensive aerodynamic analysis system, based on linearized potential theory. Three-dimensional configurations (with or without jet flaps) having multiple nonplanar surfaces of arbitrary planform and open or closed slender bodies of noncircular contour may be analyzed with APAS. As preliminary design aid, APAS allows designer to survey systematically large number of alternative configurations and component geometries economically.

#### B80-10398

##### INVISCID TRANSONIC FLOW OVER AXISYMMETRIC BODIES

J. C. SOUTH, JR. and J. D. KELLER

Jan. 1981

LANGLEY-12499

Vol. 5, No. 3, p. 363

Axisymmetric transonic flow is of interest not only because of its practical application to missile and launch vehicle aerodynamics but also because of its relation, in terms of area rule, to fully three dimensional flow. RAXBOD computer program analyzes steady, inviscid, irrotational, transonic flow over axisymmetric bodies in free air. RAXBOD uses finite-difference relaxation method to solve numerically exact formulation of disturbance velocity potential with exact surface boundary conditions. Agreement with available experimental results has been good in cases where viscous effects and wind-tunnel wall interference are not important.

#### B80-10399

##### PLASTIC DEFORMATION OF ENGINES AND OTHER NONLINEAR STRUCTURES

R. G. VOS (Boeing Co.) and J. L. ARNQUIST (Boeing Co.)

Jan. 1981

M-FS-23814

Vol. 5, No. 3, p. 363

Plastic Analysis Capability for Engines (BOPACE3D) in nonlinear stress-analysis program based on very general family of isoparametric finite elements. Although development of BOPACE3D has been heavily influenced by requirements for engine analysis (in particular Space Shuttle main engine), it is general program applicable to many nonlinear structures.

#### B80-10400

##### ANALYSIS OF A COOLED, TURBINE BLADE OR VANE WITH AN INSERT

R. E. SAUGLER

Jan. 1981

LEWIS-13293

Vol. 5, No. 3, p. 364

Computer program, TACTI, has been developed to calculate transient and steady-state temperatures, pressures, and flow in cooled turbine blade or vane with impingement insert. Coolant-side

## 06 MECHANICS

heat-transfer coefficients are calculated internally in program, with user specifying 1 of 3 modes of heat transfer at each station: impingement (including effect of crossflow); or forced convection over pin fins.

### **B80-10506** **AN OVEN FOR MANY THERMOCOUPLE REFERENCE JUNCTIONS**

L. P. LEBLANC  
Apr. 1981

**FRC-10112** Vol. 5, No. 4, p. 467

Compact, lightweight oven designed with geometric and heating symmetry holds many junctions at stable temperature. Oven has cylindrical wall with all points equidistant from heating coil. Thermocouple junctions are inserted in holes bored radially in wall. Sensor controls power supplied to heating coil, maintaining cylinder wall and junctions at constant temperature.

### **B80-10507** **ISOLATION AND MEASUREMENT OF ROTOR VIBRATION FORCES**

I. KENIGSBERG (United Technologies Corp.) and J. F. MADDEN (United Technologies Corp.)  
Apr. 1981 See also A79-18654

**LANGLEY-12476** Vol. 5, No. 4, p. 468

Mounting for helicopter gearbox measures forces generated by rotor and isolates transmission from airframe. Mountings have frequency-dependent load/displacement relationship that gives statically rigid but dynamically soft support, lowering vibratory transfer. Previous isolation by springs or force-opposing devices required strain gages to measure rotor vibration and were operative at only one vibration frequency. Active system eliminates these limitations.

### **B80-10508** **IMPROVED LEEM RANGES OVER FOUR DECADES**

J. J. SINGH, G. M. WOOD, JR., G. H. RAYBORN (University of Southern Mississippi), and F. A. WHITE (Rensselaer Polytechnic Institute)

Apr. 1981 See also NASA-TM-80172(N80-13429)

**LANGLEY-12706** Vol. 5, No. 4, p. 469

Low-energy electron magnetometer is suitable for terrestrial and aerial applications. Electron beam strikes tantalum collector plates in device, amplifying current and converting it to frequency. Current difference increases with beam deflection, providing measure of local field strength. LEEM operation requires no liquid helium unlike superconducting quantum interference device. LEEM sensitivity compares favorably with that of optical absorption magnetometers, and microsecond response range makes analyzing fast magnetic transients and signatures possible.

### **B80-10509** **IMAGER DISPLAYS FREE FALL IN STOP ACTION**

R. E. FRAZER (Caltech)

Apr. 1981

**NPO-14779** Vol. 5, No. 4, p. 470

Microprocessor-controlled imaging system displays sequence of 'frozen' images of free-falling object, using video cameras positioned along fall. Strobe lights flash as object passes each camera's viewfield. Sequence stored on video disk and displayed on television monitor is stop-action record of fall dynamics. With modification, system monitors other high speed phenomena.

### **B80-10510** **TRANSDUCER FOR EXTREME TEMPERATURES AND PRESSURES**

H. NADLER (Rockwell International Corp.)

Apr. 1981

**MSC-18778** Vol. 5, No. 4, p. 471

Transducer with limits of 500 C and 10 kilobars responds to mechanical vibrations up to 20 kHz. Vibration pickup performs well in nuclear reactors, turbines, and other extreme environments. Low pressure problems of outgassing and 'virtual' leakage experienced with conventional transducers potted in epoxy are eliminated with use of glass and metal supports. Interior opens

to atmosphere, preventing buildup of pressure-induced stresses. Spring holds transducer against housing, reducing strain distortion.

### **B80-10511** **BULK LIFETIME INDICATES SURFACE CONTAMINATION**

P. D. BLAIS (Westinghouse Electric Corp.)

Apr. 1981

**NPO-14966** Vol. 5, No. 4, p. 471

Indirect measurement of wafer surface impurities has sensitivity of 300 monolayers. Photoconductivity-decay apparatus determines bulk recombination lifetime in semiconductor materials. Bulk impurity levels before and after annealing relate to level of surface contamination. Method evaluates wafer cleaning techniques, qualifying purity of chemical and deionized water used, or monitors production process.

### **B80-10512** **BIAxIAL METHOD FOR IN-PLANE SHEAR TESTING**

H. G. BUSH and T. WELLER (National Academy of Sciences)  
Apr. 1981 See also NASA-TM-74070(N78-21489)

**LANGLEY-12680** Vol. 5, No. 4, p. 472

Method for obtaining uniform shear deformation yields more accurate values for material mechanical properties than uniaxial picture frame techniques. Forces applied are one-half usual magnitude, reducing transmitted force and related pin deformations. Biaxial method installs square sandwich specimen in stiff frame with pinned corners. Frictional effects are negligible, and stiffening of honeycomb core is corrected for in results.

### **B80-10513** **GAS ABSORPTION/DESORPTION TEMPERATURE-DIFFERENTIAL ENGINE**

C. G. MILLER (Caltech)

Apr. 1981

**NPO-14528** Vol. 5, No. 4, p. 474

Continuously operating compressor system converts 90 percent of gas-turbine plant energy to electricity. Conventional plants work in batch mode, operating at 40 percent efficiency. Compressor uses metal hydride matrix on outside of rotating drum to generate working gas, hydrogen. Rolling valve seals allow continuous work. During operation, gas is absorbed, releasing heat, and desorbed with heat gain. System conserves nuclear and fossil fuels, reducing powerplant capital and operating costs.

### **B80-10514** **INSTRUMENT MEASURES CLOUD COVER**

E. G. LAUE (Caltech)

Apr. 1981

**NPO-14936** Vol. 5, No. 4, p. 474

Eight solar sensing cells comprise inexpensive monitoring instrument. Four cells always track Sun while other four face sky and clouds. On overcast day, cloud-irradiance sensors generate as much short-circuit current as Sun sensor cells. As clouds disappear, output of cloud sensors decreases. Ratio of two sensor type outputs determines fractional cloud cover.

### **B80-10515** **COMPACT INFRARED DETECTOR**

A. GUPTA (Caltech), S. HONG (Caltech), and J. MOACANIN (Caltech)

Apr. 1981

**NPO-14864** Vol. 5, No. 4, p. 475

Broadband IR detector integrated into compact package for pollution monitoring and weather prediction is small, highly responsive, and immune to high noise. Sensing material is transparent sheet metalized with reflecting coating and overcoated with black material on same side. Pulse produced by chopping of infrared source beam creates transient 'thermal lens' that temporarily defocuses laser beam probe. Detector monitoring beam measures defocusing which parallels infrared intensity.

### **B80-10516** **FAST CALIBRATION OF GAS FLOWMETERS**

R. V. LISLE and T. L. WILSON

Apr. 1981

**KSC-11076** Vol. 5, No. 4, p. 476

Digital unit automates calibration sequence using calculator IC and programmable read-only memory to solve calibration equations. Infrared sensors start and stop calibration sequence. Instrument calibrates mass flowmeters or rotameters where flow measurement is based on mass or volume. This automatic control reduces operator time by 80 percent. Solid-state components are very reliable, and digital character allows system accuracy to be determined primarily by accuracy of transducers.

**B80-10517****WIND-SIMULATION TESTER FOR SOLAR MODULES**

J. S. GRIFFITH (Caltech)

Apr. 1981

**NPO-14837**

Vol. 5, No. 4, p. 477

Tester induces cyclic pressure loads across module surface, guaranteeing its mechanical integrity. Module to be tested is sandwiched between stiffened aluminum layers covered with rubber sheets. Automatic front and back pressure loading is cycled by pneumatic system on separate stand. Relief valves prevent overpressuring. Fixture operates at high speed, completing cycle in 5 seconds, and typically applies 2,400 pascals.

**B80-10518****HEAT PIPES COOL PROBE AND SANDWICH PANEL**

C. J. CAMARDA, L. M. COUCH, and H. N. KELLY

Apr. 1981

**LANGLEY-12637**

Vol. 5, No. 4, p. 478

Two concepts integrate heat-pipe technology. Probe with heat-pipe cooled jacket is self-contained, passive, and has no moving parts, unlike conventional air and water cooled probes. It is used in hostile, high temperature environments like wind tunnels and powerplants or on high-speed research and hypersonic cruise vehicles. Heat-pipe sandwich panel combines structural efficiency of sandwich with thermal efficiency of heat-pipe. It is used to eliminate thermal gradients and stresses, minimize thermal distortions, and transfer heat from one face of panel to other.

**B80-10519****THERMODYNAMIC AND TRANSPORT PROPERTIES OF AIR/WATER MIXTURES**

T. E. FESSLER

Apr. 1981

**LEWIS-13432**

Vol. 5, No. 4, p. 479

Subroutine WETAIR calculates properties at nearly 1,500 K and 4,500 atmospheres. Necessary inputs are assigned values of combinations of density, pressure, temperature, and entropy. Interpolation of property tables obtains dry air and water (steam) properties, and simple mixing laws calculate properties of air/water mixture. WETAIR is used to test gas turbine engines and components operating in relatively humid air. Program is written in SFTRAN and FORTRAN.

**B80-10520****CALCULATING LINEAR A, B, C, AND D MATRICES FROM A NONLINEAR DYNAMIC ENGINE SIMULATION**

L. C. GEYSER

Apr. 1981

**LEWIS-13250**

Vol. 5, No. 4, p. 479

Digital program DYGABCD generates linear state-space models for simulating turbofan and turbojet engines over complete range of power settings and flight conditions. Program is written in FORTRAN IV for batch execution and is implemented on IBM 360-series computer.

**B80-10521****STRUCTURAL DESIGN WITH STRESS AND DISPLACEMENT CONSTRAINTS**

J. KIUSALAAS (Pennsylvania State University) and G. B. REDDY (Pennsylvania State University)

Apr. 1981

**M-FS-25235**

Vol. 5, No. 4, p. 480

DESAPI program synthesizes linear elastic structures under static loads. Its design objective is finding element sizes that minimize total weight without changing layout structure. Primary constraints are upper limits on stresses and displacements

prescribed as yield and local instability criteria. Program is written in FORTRAN IV for batch execution and is implemented on IBM 360 computer.

**B80-10522****AN ALL-FORTRAN VERSION OF NASTRAN FOR THE VAX**

L. PURVES

Apr. 1981

**GSFC-12600**

Vol. 5, No. 4, p. 481

All FORTRAN version of NASA structural analysis program NASATRAN is implemented on DEC VAX-series computer. Applications of NASATRAN extend to almost every type of linear structure and construction. Two special features are available in VAX version; program is executed from terminal in manner permitting use of VAX interactive debugger, and links are interactively restarted when desired by first making copy of all NASATRAN work files.

**B80-10523****POTENTIAL FLOW IN TWO-DIMENSIONAL DEFLECTED NOZZLES**

J. D. HAWK and N. O. STOCKMAN

Apr. 1981

**LEWIS-13461**

Vol. 5, No. 4, p. 481

Three programs analyze flow: SCIRCL, geometry definition program; 24Y, incompressible two-dimensional potential-flow program; and NOZZLEC, program combining incompressible potential-flow solutions into solutions of interest after compressibility correction. Program group is written in FORTRAN IV for implementation on UNIVAC 1100/42.

**B80-10524****THE DESIGN AND ANALYSIS OF LOW-SPEED AIRFOILS**

R. EPPLER (University of Stuttgart) and D. M. SOMERS

Apr. 1981

**LANGLEY-12727**

Vol. 5, No. 4, p. 481

PROFILE program solves diverse and inverse airfoil-flow problems. It combines conformational mapping method for design of airfoils with prescribed velocity-distribution characteristics, panel method for potential-flow analysis, and boundary-layer method. PROFILE is written in FORTRAN IV for implementation on CDC 6000-series computer.

**B80-10525****TRANSONIC FLOW OVER WING/FUSELAGE CONFIGURATIONS**

C. W. BOPPE (Grumman Aerospace Corp.)

Apr. 1981

**LANGLEY-12702**

Vol. 5, No. 4, p. 482

Wing Body Code (WIBCO) program simulates flow-field configurations for reduction of design cost and improvement of aircraft performance. Inputs to WIBCO consist of ambient flow conditions and geometric configuration data; grid control and relaxation parameters are internally set. Outputs include input data echo, grid system verification, relaxation-solution convergence history, and computed velocities, pressures, forces, moments, reference lengths, and areas. Program is written in FORTRAN IV for batch execution.

**07 MACHINERY****B80-10093****PRECISION FILAMENT CUTTER**

A. D. MCHATTON, A. L. NEWCOMB, JR., and G. SCHLUFE (Bionetics Corp.)

Aug. 1980

**LANGLEY-12564**

Vol. 5, No. 1, p. 79

Automated cutter precisely chops filaments of glass, graphite, plastic, and other materials into fibers for use in composites and other applications. Cutter uses movable blade that is pushed

## 07 MACHINERY

and pulled across fixed blade. Because mass of movable blade is small and stroke is short, operation is fast, and wear and energy consumption are low. Blade cuts on both forward and return movements. Operator selects fiber length and chopping rate. After each cut, blast of air blows filament away so it can be collected.

### B80-10094

#### AUTOMATIC CONNECTOR FOR STRUCTURAL BEAMS

G. F. VON TIESSEHAUSEN

Aug. 1980

M-FS-25134

Vol. 5, No. 1, p. 80

Lightweight connector automatically aligns beams to be joined, and withstands torsion, tension, and compression loads. One beam has connector, other has receptor. Bracket aligns connector and receptor. When actuated, spring in connector pushes shaft into receptor. Hooks on shaft snap to lock into receptor slots. Union can be separated easily without damage. Connectors are designed for in-space assembly, but may be suited to ground assemblies as well.

### B80-10095

#### MECHANICAL END JOINT FOR STRUCTURAL COLUMNS

H. G. BUSH and R. E. WALLSOM (Vought Corp.)

Aug. 1980

LANGLEY-12482

Vol. 5, No. 1, p. 81

Connector for tubular struts permits construction of lightweight frames without tools or assembly equipment. Two main components are node fitting and strut element. Components are aligned approximately and pushed together. Design accommodates reasonable axial and rotational misalignment of nodes and struts. Also, individual columns can be inserted into receptacle and given slight push by operator, trigger pins release ratchet, allowing energy stored in springs to rotate screw into nut in receptacle.

### B80-10096

#### SELF-ENERGIZED SCREW COUPLING

A. E. LEFEVER (Rockwell International Corp.) and R. S. TOTAH (Rockwell International Corp.)

Aug. 1980

M-FS-25340

Vol. 5, No. 1, p. 82

Threaded coupling carries its own store of rotational energy. Originally developed to ease task of astronauts assembling structures in space, coupling offers same advantages in other hazardous operations, such as underwater and in and around nuclear reactors. Coupling consists of two parts: crew portion and receptacle. When screw portion is inserted into receptacle and given slight push by operator, trigger pins release ratchet, allowing energy stored in springs to rotate screw into nut in receptacle.

### B80-10097

#### AUTOMATIC SHUTOFF VALVE

S. F. HAWKINS (Rockwell International Corp.) and C. W. OVERBEY (Rockwell International Corp.)

Aug. 1980

MSC-19385

Vol. 5, No. 1, p. 8

Cellulose-sponge disk absorbs incoming water and expands with enough force to shut valve. When water recedes, valve opens by squeezing sponge dry to its original size. This direct mechanical action is considered more reliable than solenoid valve.

### B80-10098

#### WISE HOLDS SPECIMENS FOR MICROSCOPE

W. N. GREULE (Rockwell International Corp.)

Aug. 1980

MSC-18690

Vol. 5, No. 1, p. 83

Convenient, miniature, spring-loaded clamp holds specimens for scanning electron microscope. Clamp is made out of nesting sections of studded angle-aluminum. Specimens are easier to mount and dismount with vise than with conductive adhesive or paint.

### B80-10099

#### TUBING CUTTER FOR TIGHT SPACES

A. S. GIRALA

Aug. 1980

MSC-18538

Vol. 5, No. 1, p. 84

Cutter requires few short swings of handle to rotate its cutting edge full 360 around tube. It will cut tubing installed in confined space that prevents free movement of conventional cutter. Cutter is snapped onto tube and held in place by spring-loaded clamp. Screw ratchet advances cutting wheel.

### B80-10100

#### ALUMINUM-ENCASED LEAD Mallet

F. CHIN (Rockwell, International Corp.) and I. F. PARDUE (Rockwell International Corp.)

Aug. 1980

MSC-18529

Vol. 5, No. 1, p. 85

Soft hammer will not mar or distort work piece. Aluminum casing, made from aluminum tube, reduces flaring and flaking of lead. Lead can be melted out and recast to refurbish hammer when necessary. Hammer would replace plastic, lead, and aluminum soft hammers currently used widely in industry.

### B80-10101

#### CLAMSHELL DOOR SYSTEM

D. R. HELBLE (Rockwell International Corp.)

Aug. 1980

MSC-18488

Vol. 5, No. 1, p. 85

Space shuttle system opens, closes, and latches bay doors. System includes remotely controlled 'zipper latch' that accommodates misalignment. Opening, closing, and latching follow specific sequences, and are monitored from cockpit. Entire system could be modified for commercial jetliners and marine vessels with underwater access doors.

### B80-10102

#### MEASURING BALL-BEARING LOADS

M. F. BUTNER (Rockwell International Corp.)

Aug. 1980

M-FS-19505

Vol. 5, No. 1, p. 86

Contour of wear-path boundary in bearing race gives precise information about magnitude, direction and imbalance of load. Simple tool measures height of path perimeter as bearing race is rotated manually on flat surface.

### B80-10103

#### RETAINING A SLEEVE ON A SHAFT

R. PESSIN (Rockwell International Corp.)

Aug. 1980

M-FS-19518

Vol. 5, No. 1, p. 87

Snap ring with slotted tabs fits groove in shaft. Sleeve to be held on shaft fits over snap ring keeping it from expanding. Tabs are bent out to keep sleeve from slipping off shaft.

### B80-10104

#### COMPACT POSITIONING FLANGE

S. L. HOOPER (Kentron Hawaii, Ltd.)

Aug. 1980

MSC-14876

Vol. 5, No. 1, p. 88

Flange adjusts center of rotation of gimble-mounted objects such as telescopes. Three aluminum plates are machined to have interlocking orthogonal keys and ways. Outer plate is mounted to shaft. Inner plate is attached to object. Middle and inner plate slide along on axis. Screws slide in slots parallel to ways for adjustment, then tighten to lock position along each axis. Device is similar to crossed ways found on industrial machine tools, but simpler, lighter, and much smaller.

### B80-10105

#### BOLT-TENSION INDICATOR

K. L. WILSON (Rockwell International Corp.)

Aug. 1980

M-FS-19324

Vol. 5, No. 1, p. 88

Pin attached to bottom of hole through long axis of machine bolt can be used to indicate correct bolt tension without torque meters or extensometers. Bolt elongates when tightened, but pin does not, and so appears to recede within bolt head. Steps cut in exposed end of pin would indicate acceptable range of

tightness. Design would be particularly convenient in field locations without specialized instrumentation.

#### B80-10106

##### DUAL MODE ACTUATOR

S. C. RICK

Aug. 1980

LANGLEY-12412

Vol. 5, No. 1, p. 89

Compact mechanism functions under automatic control, manual control, or both. Output shaft rotation is controlled automatically by two hydraulic cylinders or manually by movement of input lever. Automatic control movement is isolated from manual-control movement by adjustment of force on piston spring. Actuator can be modified to control straight line position rather than rotation, or to open valves that regulate fluid flow in actuator, thus creating special movements other than simple rotation.

#### B80-10107

##### ZERO-TORQUE SPANNER WRENCH

M. V. FRIEDEL (Martin Marietta Corp.)

Aug. 1980

MSC-14843

Vol. 5, No. 1, p. 90

Wrench converts gripping action of hand to rotary motion without imparting reactive moments or forces on part being turned or on operator. Wrench should be useful in undersea operations and other delicate work where reactive forces and torques have to be controlled. In design for valve tightening, tool resembles cross between conventional spanner wrench and pilers. One handle engages valve body; second handle has ratchet pawl that engages toothed coupling ring on perimeter of valve handle. When operator squeezes wrench handles, valve handle rotates with respect to valve body.

#### B80-10108

##### DRILL-MOTOR HOLDING FIXTURE

E. N. CHARTIER (Rockwell International Corp.) and L. N. CULP (Rockwell International Corp.)

Aug. 1980

MSC-18582

Vol. 5, No. 1, p. 91

Guide improves accuracy and reduces likelihood of bit breakage in drilling large work pieces. Drill motor is mounted on pipe that slides on furniture clamp. Drill is driven into work piece by turning furniture-clamp handle.

#### B80-10109

##### SELF-ACTING SHAFT SEALS

L. P. LUDWIG

Aug. 1980

LEWIS-13229

Vol. 5, No. 1, p. 92

Report reviews operating principles and design of self-acting seals. Influences of adverse operating conditions are considered also. Elements of analysis used in seal performance predictions are described and evaluated. Mathematical models for obtaining seal force balance and equilibrium film thickness are outlined. Self-acting seals are nonrubbing, have lower leakage rates than labyrinth seals, and are well suited for advanced aircraft engines.

#### B80-10240

##### FLARED TUBE ATTACHMENT FITTING

I. D. ALKIRE (Rockwell Intern. Corp.) and J. P. KING, JR. (Rockwell Intern. Corp.)

Sep. 1980

MSC-18416

Vol. 5, No. 2, p. 213

Tubes can be flared first, then attached to valves and other flow line components, with new fitting that can be disassembled and reused. Installed fitting can be disassembled so parts can be inspected. It can be salvaged and reused without damaging flared tube; tube can be coated, tempered, or otherwise treated after it has been flared, rather than before, as was previously required. Fitting consists of threaded male portion with conical seating surface, hexagonal nut with hole larger than other diameter of flared end of tube, and split ferrule.

#### B80-10241

##### TUBE FLARE INSPECTION TOOL

G. E. MEUNIER (Rockwell Intern. Corp.)

Sep. 1980

MSC-19636

Vol. 5, No. 2, p. 213

Flare angle and symmetry of tube ends can be checked by simple tool that consists of two stainless steel pins bonded to rubber plug. Primary function of tool is to inspect tubes before they are installed, thereby eliminating expense and inconvenience of repairing leaks caused by imperfect flares. Measuring hole tapers, countersink angles, and bearing race angles are other possible uses. Tool is used with optical comparator. Axis of tool is aligned with centerline of tube. Shadow of seated pins on comparator screen allows operator to verify flare angle is within tolerance.

#### B80-10242

##### A VERSATILE TUNNEL ACTS AS A FLEXIBLE DUCT

N. D. BROWN (Goodyear Aerospace Corp.), N. C. COSTAKOS (Goodyear Aerospace Corp.), and G. L. JEPPESEN (Goodyear Aerospace Corp.)

Sep. 1980

M-FS-22836

Vol. 5, No. 2, p. 214

Tunnel activated by cable assembly can be expanded, contracted, and bent similar to flexible duct without uncoupling at either end. Tunnel was developed to join reusable space vehicle with cargo module and could be modified to be used as hydraulic or pneumatic hose or duct connecting complex moveable joints in remote manipulators and earth moving machinery.

#### B80-10243

##### MECHANICAL HAND FOR GRIPPING OBJECTS

K. H. CLARK and J. D. JOHNSTON

Sep. 1980

M-FS-23692

Vol. 5, No. 2, p. 215

End effector serves as 'hand' for remote manipulator spacecraft system to grasp objects of various sizes. Device has built in flexible wrist joint 'cartilage' for increased gripping force without significant strain on mechanical connections.

#### B80-10244

##### HIGH-PERFORMANCE, MULTIROLLER TRACTION DRIVE

S. LOWENTHAL, D. A. ROHN, E. ZARETSKY, N. E. ANDERSON (U.S. Army Research & Technology Lab.), and A. NASVYTIS (Transmission Research, Inc.)

Sep. 1980 See also NASA-TP-1378(N79-13369)

LEWIS-13347

Vol. 5, No. 2, p. 216

Fixed-speed-ratio traction drive (NASVYTRAC) has been developed that can transmit high power across large speed ratio using compact cluster of rollers. Traction drive transmits power without gear teeth, through shear forces on thin lubricant film that separates drive rollers. Automatic loading mechanism regulates normal load between rollers so sufficient normal load is present to transmit required torque without slip or overloading.

#### B80-10245

##### LOCKNUT PRELOAD TOOL

J. E. GREENWOOD (Rockwell Intern. Corp.) and J. F. KAUPPI (Rockwell Intern. Corp.)

Sep. 1980

MSC-16153

Vol. 5, No. 2, p. 217

Small tool replaces large torque wrench for turning locknuts. Preload tool 'stretches' threaded rod on which locknut turns, reducing force on nut which can then be turned by common hand wrench. Advantages are reduced cost and weight, ease of manipulation in cramped space near actuators, and portability.

#### B80-10246

##### SELF-ADJUSTING MECHANICAL SNUBBING LINK

E. V. HOLMAN (Rockwell Intern. Corp.)

Sep. 1980

MSC-16134

Vol. 5, No. 2, p. 218

All-mechanical shock-absorber concept has several advantages over hydraulic devices. Snubbing link automatically adjusts length under light loads, locks at any position when onslaught exceeds design limits for which it is set, and will not leak oil or require periodic servicing. Concept can be incorporated as safety device on material handling systems or as energy absorption device or governor for machines or equipment.

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### B80-10247

#### BAYONET PLUG WITH RAMP-ACTIVATED LOCK

K. E. WOOD (Rockwell Intern. Corp.)

Sep. 1980

MSC-18526

Vol. 5, No. 2, p. 218

Matched pair of washers with broad surface ramps is locking mechanism in bayonet plug. It can be used where threaded springs and fasteners are impractical because of extreme temperatures or other environmental incompatibility. Matched pair of ramped washers is placed on plug and bayonet inserted. Inner slot of one washer matches contour of plug; this washer is stationary. Inner slot of second washer is circular. When second washer is rotated, washers push against bayonet plug, locking it in place. Retaining wire secures plug.

### B80-10248

#### HEAT-PIPE SENSOR FOR REMOTE LEVELING

J. P. MARSHBURN

Sep. 1980

GSFC-12095

Vol. 5, No. 2, p. 219

System gives level readings in inaccessible areas. Level sensor is equipped with three thermocouples used to measure temperature differences that arise when pipe is tilted. When platform on which pipe is resting is level, three thermocouple recordings are identical. When readings are unequal, platform is leveled by remote control. System can replace expensive optical equipment and can function in cold, vacuum, and hot humid environments that produce nonlinear expansion and contraction in conventional equipment. Other advantages include low cost, no moving parts, and operation in toxic environments.

### B80-10249

#### AUTOMATIC 35 MM SLIDE DUPLICATOR

H. F. SEIDEL and R. E. TEXLER

Sep. 1980

LEWIS-13399

Vol. 5, No. 2, p. 220

Automatic duplicator is readily assembled from conventional, inexpensive equipment and parts. Series of slides can be exposed without operator attention, eliminating considerable manual handling and processing ordinarily required. At end of programmed exposure sequence, unit shuts off and audible alarm signals completion of process.

### B80-10250

#### THE 3-D GUIDANCE SYSTEM WITH PROXIMITY SENSORS

A. K. BEJCZY (Caltech)

Sep. 1980

NPO-14521

Vol. 5, No. 2, p. 221

Four proximity sensors help to guide mechanical claw into alignment with target fixture. Digital signals are used to sense distance and to align roll, pitch, and yaw with respect to target before it is grasped. Sixteen sensor-to-operator messages are possible with binary signal system. Similar, more precise alternative presents 75 workable logic states; most precise alternative uses continuous calibrated data from sensors.

### B80-10251

#### AUTOMATIC CONNECTOR JOINS STRUCTURAL COLUMNS

G. G. JACQUEMIN (Lockheed Missiles & Space Co., Inc.)

Sep. 1980

LANGLEY-12578

Vol. 5, No. 2, p. 222

Connector snap-locks over toothed bolthead mounted on column end, forming rigid joint that will not bend or twist. Connector is used in conventional construction to install temporary structures or as mechanical coupler. Up to nine receptacles can be clustered in one node to join up to nine converging columns.

### B80-10252

#### TEST FITTINGS FOR DIMENSIONALLY CRITICAL TUBES

R. HAGLER (Caltech)

Sep. 1980

NPO-14399

Vol. 5, No. 2, p. 222

Method using lightweight fitting protects tubes and tube stubs during testing and through to final welding. Fitting does

not interfere with final welding or brazing like temporary test fittings, and is not heavy like machined-on integral fittings with face-seal O-rings. Fitting approach is adaptable to many types of components, including valves, transducers, and filters.

### B80-10253

#### ELECTROMECHANICAL SLIP SENSOR

A. K. BEJCZY (Caltech) and S. PARK (Caltech)

Sep. 1980

NPO-14654

Vol. 5, No. 2, p. 223

Sensor indicates direction of slip and slip rate of objects handled by remote manipulators. Freely movable spheroid with staggered pattern of surface indentations rotates in direction of slipping body, tilting shaft with conductive disk plate. Plate assembly is bent toward contact corresponding to direction of slip and is flicked by indentations at rate corresponding to slip rate. Slip direction and rate are determined using LED's arranged circularly or microcomputer with CRT display.

### B80-10254

#### X-RAY BEAM POINTER

C. W. NELSON (Beech Aircraft Co.)

Sep. 1980

MSC-18590

Vol. 5, No. 2, p. 224

Inexpensive, readily assembled pointer aims X-ray machine for welded assembly radiographs. Plumb bob used for vertical alignment and yardstick used to visualize X-ray paths were inconvenient and inaccurate. Pointer cuts alignment time by one-half and eliminates necessity of retakes. For 3,000 weld radiographs, pointer will save 300 worker-hours and significant materials costs.

### B80-10255

#### HANDTOOL ASSISTS IN BUNDLING CABLES

E. J. STRINGER (Rockwell Intern. Corp.)

Sep. 1980

MSC-18567

Vol. 5, No. 2, p. 225

Simple tool makes it possible to bundle electrical cables in channel or 'tray' without requiring cables be lifted out. Procedure for bundling is faster and less awkward than lifting method. Used with commercially-available plastic ribbons that tie cables together, tool guides ribbon along tray wall, through bracket at bottom of tray, and up opposite wall. One end of ribbon locks in other end, securing cable bundle.

### B80-10256

#### SLEEVE PULLER SALVAGES WELDED TUBES

J. F. WEAVER (Rockwell Intern. Corp.)

Sep. 1980

MSC-18686

Vol. 5, No. 2, p. 225

Tool removes sleeve remnants without distorting or damaging tubes, unlike pliers and other conventional handtools. Tubes can be reused, saving time, labor, and material in many applications. Sleeve-removal fixture consists of pressure screw, swing arm, locking screws, and base. It removes sleeve remnant from tubing after welded joint has been sawed through.

### B80-10257

#### A LINEAR MAGNETIC MOTOR AND GENERATOR

P. A. STUDER

Sep. 1980

GSFC-12518

Vol. 5, No. 2, p. 226

In linear magnetic motor and generator suitable for remote and hostile environments, magnetic forces drive reciprocating shaft along its axis. Actuator shaft is located in center of cylindrical body and may be supported by either contacting or noncontacting bearings. When device operates as bidirectional motor, drive coil selectively adds and subtracts magnetic flux to and from flux paths, producing forces that drive actuator along axis. When actuator is driven by external reciprocating engine, device becomes ac generator.

### B80-10258

#### CRYOGENIC-STORAGE-TANK SUPPORT

G. H. WISDOM (McDonnell Douglas Corp.)

Sep. 1980



**MSC-14848** Vol. 5, No. 2, p. 227  
Support isolates tank from thermal and mechanical loading by environment. Design uses combination of well-known common mechanisms to isolate tank and allow for tank expansion and contraction due to temperature and pressure changes. Similar support method is used on nitrogen tanks.

**B80-10259**  
**ROTOR TRANSIENT ANALYSIS**  
P. E. ALLAIRE (Virginia Univ.), K. C. CHOY (Virginia Univ.), and E. J. GUNTER (Virginia Univ.)  
Sep. 1980

**LEWIS-13230** Vol. 5, No. 2, p. 228  
Undamped modes approximate dynamic behavior of rotors and bearings. Application of modal analysis to uncouple equations of motion simplifies stability, steady-state unbalance response, and transient response analysis of system; nonlinear stability is predicted from calculated frequency spectra. Analysis provides designers with complete information without involving large-scale computational costs. Programs are written in FORTRAN IV for use on CDC 6600 computer.

**B80-10401**  
**CLEAVING MACHINE FOR HARD CRYSTALS**  
J. S. J. BENEDICTO and F. HALLBERG  
Jan. 1981

**GSFC-12584** Vol. 5, No. 3, p. 367  
Hard crystalline materials such as lithium fluoride (LiF) are cleaved in thin sections by semiautomatic machine. Yield of undistorted LiF crystals is almost 100 percent, even when cleaved section is only 1/32 inch thick. Machine contains spring-activated hammer that limits penetration of blade and controls shock that cleaves crystal. Fixture with spring-loaded clamps precisely locates and holds crystal, restraining it in ideal position for cleaving. Crystal then splays apart.

**B80-10402**  
**ABRASIVE DRILL FOR RESILIENT MATERIALS**  
A. J. KOCH  
Jan. 1981

**LEWIS-13411** Vol. 5, No. 3, p. 368  
Resilient materials normally present problem in obtaining accurate and uniform hole size and position. Tool is fabricated from stiff metal rod such as tungsten or carbon steel that has diameter slightly smaller than required hole. Piercing/centering point is ground on one end of rod. Rod is then plasma-sprayed (flame-sprayed) with suitable hard abrasive coating. High-speed, slow-feed operation of tool is necessary for accurate holes, and this can be done with drill press, hard drill, or similar machines.

**B80-10403**  
**DRILLING AT RIGHT ANGLES IN BLIND HOLES**  
R. PESSIN (Rockwell International Corp.)  
Jan. 1981

**M-FS-19535** Vol. 5, No. 3, p. 369  
Tool drills small hole perpendicular to and at bottom of blind hole. It consists of carbide cutter brazed to flexible shaft, inside thin metal tube with 90 degree bend. Wood dowel holds tube while motor turns shaft and drives cutter. It was developed for clearing plugged fuel orifices. Concept is adaptable to other hard-to-reach drilling situations.

**B80-10404**  
**SOLAR-POWERED AIRCRAFT**  
W. H. PHILLIPS  
Jan. 1981

**LANGLEY-12615** Vol. 5, No. 3, p. 369  
Solar-powered aircraft, driven by electric motor, has vertical and horizontal wings. Design allows aircraft to fly straight path while banked, permitting optimal exposure of its wing-mounted solar cells to Sun. Such aircraft would fly at altitude high enough to be above clouds and to avoid winds with velocities much greater than its own airspeed. Its most likely application would be as pilotless aircraft to take advantage of its ability to remain aloft for long periods (for very long flights).

**B80-10405**  
**BALL-JOINT GROUNDING RING**  
P. J. A. APERLO (Rockwell International Corp.), P. A. BUCK (Rockwell International Corp.), and V. A. WELDON (Rockwell International Corp.)  
Jan. 1981

**MSC-18824** Vol. 5, No. 3, p. 371  
In ball and socket joint where electrical insulator such as polytetrafluoroethylene is used as line to minimize friction, good electrical contact across joint may be needed for lightning protection or to prevent static-charge build-up. Electrical contact is maintained by ring of spring-loaded fingers mounted in socket. It may be useful in industry for cranes, trailers, and other applications requiring ball and socket joint.

**B80-10406**  
**VERSATILE MODULAR SCAFFOLDS**  
J. KERLEY  
Jan. 1981

**GSFC-12606** Vol. 5, No. 3, p. 372  
Movable and fixed modular scaffolds can be tailored to most scaffolding needs by interconnecting only 4 basic structural elements: platforms, rails, vertical-support angles, and stiffener. Standard nuts and bolts are used to join elements, simplifying construction, and reducing costs. Scaffolds are rigid and can be made any length. They are stable on unlevel ground and can extend to well over 50 feet in height. Scaffolds allow for internal elevators and for wheels and air mounts so that same elements can be used for standing or movable scaffold.

**B80-10407**  
**RESHAPING TUBE ENDS FOR WELDING**  
W. H. EMANUEL (McDonnell Douglas Corp.) and C. A. HEADLEY (McDonnell Douglas Corp.)  
Jan. 1981

**MSC-18462** Vol. 5, No. 3, p. 373  
Tube ends are rounded in preparation for welding by new semiautomatic tool. Tubes that have been trimmed close to bend may be deformed by process. To restore roundness, out-of-round tube is opened, plug inserted, and crimper compresses tube into proper shape around plug.

**B80-10408**  
**REMOTE MANIPULATOR WITH FORCE FEED-BACK**  
J. W. HILL (SRI International) and J. K. SALISBURY, JR. (SRI International)  
Jan. 1981

**ARC-11272** Vol. 5, No. 3, p. 373  
Controller for remote manipulators gives user 'feel' for forces required to lift, slide, turn, and otherwise handle objects. Because operator experiences sensations similar to those he would perceive if he handled objects directly, he needs much less skill and training for manipulator than for one with force feedback. It was developed to handle hazardous materials, such as radioactive substances, explosives, or corrosive chemicals. Other possible uses include tracking moving objects, vehicle control, and human interaction with computers (for example, via three dimensional display of computer model).

**B80-10409**  
**SPRAYING SUSPENSIONS UNIFORMLY**  
W. P. PRASTHOFER  
Jan. 1981

**M-FS-25139** Vol. 5, No. 3, p. 374  
With head on each of its ends, bolt can be disengaged from its blind side. Bolt has conventional hexagonal head on one end and smaller hexagonal head on its threaded end. Since reduced head is smaller than bolt diameter, it does not interfere with insertion of bolt shank in bolthole. However, it can be turned by wrench to release bolt from its blind (threaded) end. Bolt should be tethered on its large-head end so that it does not drop away from assembly.

**B80-10410**  
**TWO-HEADED BOLT**  
G. W. JEFFERS (Rockwell Intern. Corp.)

## 07 MACHINERY

Jan. 1981

**M-FS-19619** Vol. 5, No. 3, p. 375

Coarse, multi-ingredient suspensions are sprayed on surface smoothly and uniformly with aid of nozzle attachment for commercial spray gun. Nozzle attachment is contoured internally to suppress overspray and to prevent spray from segregating. From its conical inlet, nozzle converges smoothly to throat, then diverges in bell-shaped chamber that allows suspension to flow uninterruptedly without building up turbulently in nozzle. End of nozzle is adjustable and can be extended or retracted to avoid dripping when inlet pressure, pump pressure, or density of mixture changes.

**B80-10411**

**COMPACT TABLE-TILTING MECHANISM**

F. R. MITCHELL (Frank R. Mitchell and Assoc.)

Jan. 1981

**NPO-14800** Vol. 5, No. 3, p. 376

Optical components are oriented precisely by motorized device for manipulating objects attached to plane tilt table. Mechanism is compact, simple, and has low backlash. It consists of drive motor, rotatable disk, rigid link, and table. Motor rotates about vertical axis, and motion is converted through disk and rigid link to rotation of table about perpendicular axis.

**B80-10412**

**TIME-SHARING SWITCH FOR VACUUM BRAZING**

J. A. STEIN

Jan. 1981

**MSC-18699** Vol. 5, No. 3, p. 376

Switching unit changes power and cooling-water connections between two vacuum-brazing machines. It allows both units to be powered by single radio-frequency (RF) generator. One machine can be used for brazing while bell jar of other is being evacuated (20 minute process) in preparation for brazing or is being cooled after brazing (10 minute process).

**B80-10413**

**LIMITING CURRENT IN ELECTRON-BEAM WELDERS**

K. W. SPIEGEL

Jan. 1981

**M-FS-19503** Vol. 5, No. 3, p. 377

Damage to workpiece by excessive current in electron-beam welder is prevented by mechanism that accurately adjusts anode-to-cathode spacing. Mechanism is installed on standard Sciaky (or equivalent) electron-beam gun with only minimal modification. By turning knurled knob and observing digital readout of anode/cathode separation, machine operator adjusts welder for safe maximum current before welding begins.

**B80-10414**

**TORQUE-WRENCH EXTENSION**

D. H. PETERSON (Rockwell International Corp.)

Jan. 1981

**MSC-18769** Vol. 5, No. 3, p. 378

Torque-wrench extension makes it easy to install and remove fasteners that are beyond reach of typical wrenches or are located in narrow spaces that prevent full travel of wrench handle. At same time, tool reads applied torque accurately. Wrench drive system, for torques up to 125 inch-pounds, uses 2 standard drive-socket extensions in aluminum frame. Extensions are connected to bevel gear that turns another bevel gear. Gears produce 1:1 turn ratio through 90 degree translation of axis of rotation. Output bevel has short extension that is used to attach 1/4-inch drive socket.

**B80-10415**

**QUICK MIXING OF EPOXY COMPONENTS**

D. E. DUNLAP, JR. (McDonnell Douglas Corp.)

Jan. 1981

**MSC-18731** Vol. 5, No. 3, p. 379

Two materials are mixed quickly, thoroughly, and in precise proportion by disposable cartridge. Cartridge mixes components of fast-curing epoxy resins, with no mess, just before they are used. It could also be used in industry and home for caulking, sealing, and patching. Materials to be mixed are initially isolated

by cylinder wall within cartridge. Cylinder has vanes, with holes in them, at one end and handle at opposite end. When handle is pulled, grooves on shaft rotate cylinder so that vanes rotate to extrude material A uniformly into material B.

**B80-10416**

**WRENCH FOR SMOOTH OR DAMAGED FASTENERS**

R. CARRILLO (Rockwell International Corp.)

Jan. 1981

**MSC-18772** Vol. 5, No. 3, p. 380

Smooth-surfaced or damaged fasteners that cannot be gripped by conventional wrench can be unscrewed by special wrench. It can be used in tight spaces and will not damage adjacent structures. Wrench consists of central handle and 2 independent jaws with serrated teeth. Teeth are placed on fastener to be removed, and handle is rotated until fastener is gripped with positive locking action. Rotation of wrench handle removes fastener.

**B80-10526**

**INTERLOCKING WEDGE JOINT IS EASILY ASSEMBLED**

M. J. LONG

Apr. 1981

**LANGLEY-12729** Vol. 5, No. 4, p. 485

Wedge joint links structural members in manual, remote, or automated assemblies. Joint is simple enough to be assembled by undersea divers, workers in nuclear reactors, and other wearing gloves or bulky clothing. Combination of wedging angles on parts overcomes structural misalignments and forces assembly into true position as locking sleeve moves into place. Joint transmits tension, compression, bending moments and torsion and is inherently insensitive to thermal excursions, vibration, and machining tolerance buildup.

**B80-10527**

**PNEUMATIC-POWER SUPPLY**

R. C. KRAMER (Rockwell International Corp.)

Apr. 1981

**MSC-18855** Vol. 5, No. 4, p. 486

Portable compressed air supply has two or more outputs at pressures from 20 to 100 psi. Applications include operating production equipment, spraying paint and lubricants, and pressurizing refrigeration systems. Supply filters air from standard high-pressure line, reduces it to working pressure, and adds lubricant when required. Regulator supplies low-pressure air to output channels. On channel lines, vernier-control valves select output pressures.

**B80-10528**

**SIDEWALL PENETRATOR FOR OIL WELLS**

E. R. COLLINS, JR. (Caltech)

Apr. 1981

**NPO-14306** Vol. 5, No. 4, p. 487

Penetrator bores horizontal holes in well casing to increase trapped oil drainage. Several penetrators operated by common drive are inserted into well at once. Shaft, made from spiraling cable, rotates and thrusts simultaneously through rigid curvilinear guide tube forcing bit through casing into strata. Device pierces more deeply than armor-piercing bullets and shaped explosive charges.

**B80-10529**

**FOUR-WHEEL DUAL BRAKING FOR AUTOMOBILES**

H. B. EDWARDS

Apr. 1981

**LANGLEY-12687** Vol. 5, No. 4, p. 488

Each master cylinder applies braking power to all four wheels unlike conventional systems where cylinder operates only two wheels. If one master system fails because of fluid loss, other stops car by braking all four wheels although at half force.

**B80-10530**

**LOCK FOR HYDRAULIC ACTUATORS**

R. H. WOOD (Rockwell International Corp.)

Apr. 1981

**MSC-18853** Vol. 5, No. 4, p. 489

Two clamps hold rod in fixed extension from cylinder even when power is off, converting actuator into stiff structural member. Locked actuator is useful as mechanical support or linkage or as fail-safe device in case of loss of hydraulic pressure. Potential applications include manufacturing processes and specialized handling and holding devices.

**B80-10531**  
**GENTLE ARRESTER FOR MOVING BODIES**  
R. A. HULL  
Apr. 1981

**LANGLEY-12372** Vol. 5, No. 4, p. 490  
Wire cable absorbs energy at constant rate with reduced shock and rebounding. Cable typically elongates to 90 percent of its potential, but is surrounded by braided sheath to absorb remaining energy should it break prematurely. Applications of arrester include passenger restraint in air and land vehicles, parachute risers, and ground snatch by aircraft. Possible cable material is type 302 stainless steel.

**B80-10532**  
**SOFT CONTAINER FOR EXPLOSIVE NUTS**  
D. C. GLENN, W. E. DRUMMOND, and G. MILLER  
Apr. 1981

**MSC-18871** Vol. 5, No. 4, p. 491  
Flexible fabric fits over variety of assembly shapes to contain debris produced by detonations or safety tests. Bag material is woven multifilament polyamide or aramid. Belt loops hold bag to clamp. Ring supports explosive nut structure and detonator wires, and after nut is mounted, bag and clamp are slipped over ring and fastened.

**B80-10533**  
**CYLINDRICAL BEARING ANALYSIS**  
R. J. KLECKNER (SKF Industries) and J. PIRVICS (SKF Industries)  
Apr. 1981

**LEWIS-13393** Vol. 5, No. 4, p. 491  
Program CYBEAN computes behavior of rolling-element bearings including effects of bearing geometry, shaft misalignment, and temperature. Accurate assessment is possible for various outer-ring and housing configurations. CYBEAN is structured for coordinated execution of modules that perform specific analytical tasks. It is written in FORTRAN IV for use on the UNIVAC 1100/40 computer.

## 08 FABRICATION TECHNOLOGY

**B80-10110**  
**VERIFYING ROOT FUSION IN ELECTRON-BEAM WELDS**  
F. L. BECKER (Rockwell International Corp.), S. DOCTOR (Rockwell International Corp.), and R. E. KLEINT (Rockwell International Corp.)  
Aug. 1980

**M-FS-19499** Vol. 5, No. 1, p. 95  
Ultrasonic equipment and x-y recorder indicate where back side of joint is properly welded. Wire waveguide placed in groove at root of joint to be welded is fused when joint is adequately penetrated. Ultrasonic signal moving down waveguide is reflected where guide is melted. Change in reflected-signal arrival time with change in weld-head position is nearly constant unless joint is incompletely penetrated. Method permits determination of penetration depth in preweld samples without opening vacuum chamber and sectioning weld. Technique is particularly valuable when back side of joint is inaccessible.

**B80-10111**  
**X-RAY TECHNIQUE VERIFIES WELD-ROOT FUSION**  
R. E. KLEINT (Rockwell International Corp.)  
Aug. 1980

**M-FS-19468** Vol. 5, No. 1, p. 96

Small holes drilled along back edge of surface to be joined are filled when weld root is adequately fused. Holes 2% of thickness of material can be detected with X-rays. Absence of detectable holes indicates good weld. Procedure has been proven in production and is more reliable than conventional X-ray methods.

**B80-10112**  
**ETCHANT FOR INCOLOY-903 WELDS**  
J. A. GERSTMEYER (Rockwell International Corp.)  
Aug. 1980

**M-FS-19378** Vol. 5, No. 1, p. 96  
Special reagent consists of 1 part 90% lactic acid, 1 part 70% nitric acid, and 4 part, 37% hydrochloric acid. Solution etches parent and weld metals at same rate, without overetching. Underlying grain structure of both metals is revealed.

**B80-10113**  
**CHEMICAL-MILLING SOLUTION FOR INVARI ALLOY**  
W. BATIUK (Perkin-Elmer Corp.)  
Aug. 1980

**M-FS-25365** Vol. 5, No. 1, p. 97  
Excellent surface finishes and tolerances are achieved using two formulations. Solution A gives finish of 3.17 micrometers after milling at 57 to 63 deg C. Constituents of A are: Hydrofluoric acid (70%), 5.8 oz/gal; nitric acid (40-42) degrees Baume, 40 oz/gal. Alternative solution gives 2.16 micrometer finish, and differs from A by addition of 7% phosphoric acid. Formulations eliminate channeling at root fillets, dishing, island formation, and overhangs.

**B80-10114**  
**ELIMINATING UNDERBEAD FISSURING IN SUPERALLOYS**  
R. D. BETTS (Rockwell International Corp.)  
Aug. 1980

**M-FS-19460** Vol. 5, No. 1, p. 97  
Parameters that produce high-integrity overlay welds in Incoloy-903, Incoloy-88, and Inconel-718 differ from those in conventional metal-in groove welds. Reduced weld velocity eliminates underbead crack-inducing level.

**B80-10115**  
**ION-BEAM CLEANING FOR COLD WELDS**  
B. L. SLATER  
Aug. 1980

**LEWIS-12982** Vol. 5, No. 1, p. 98  
1000 eV beam bombarding metal surfaces to be joined removes oxides and contaminants at rate of several atomic layers per second for current density of 1 mA/sq. cm. Clean surfaces can then be joined by squeezing them together. With ion-beam cleaning, mating force for strong bond is low enough to cause only 1% deformation. Conventional cold-welding requires about 70% deformation for bonding. Technique was tested successfully on aluminum to aluminum welds, copper to copper, copper to aluminum, copper to nickel, and silver to iron. Base metals failed before welds in tear test.

**B80-10116**  
**COATINGS FOR HYBRID MICROCIRCUITS**  
D. L. KINSER (Vanderbilt Univ.)  
Aug. 1980

**M-FS-25292** Vol. 5, No. 1 p. 99  
Silicone or parylene coatings protect circuits from damage by battery of military standard tests. PIND (Partial Impact Noise Detection) test proved unreliable in predicting failure for either coated or uncoated circuits.

**B80-10117**  
**PLACEMENT TECHNIQUE FOR SEMICUSTOM DIGITAL LSI CIRCUITS**  
B. CARROLL (Auburn Univ.) and G. W. COX (Auburn Univ.)  
Aug. 1980

**M-FS-25324** Vol. 5, No. 1, p. 100  
Small lots of special-purpose integrated circuits are fabricated from standard transistor arrays. Folded linear order of cells minimizes interconnection length and puts cell in juxtaposition. Cell-placement technique is carried out via computer program.

## 08 FABRICATION TECHNOLOGY

### B80-10118

#### A GENERAL LOGIC STRUCTURE FOR CUSTOM LSI'S

M. W. SIEVERS (Caltech)

Aug. 1980

**NPO-14410**

**Vol. 5, No. 1, p. 101**

Structure composed of standardized-circuit arrays reduces cost and complexity of fabricating special integrated circuits. Desired circuits are formed from basic mask, custom cuts, and contact points. Interactive computer program speeds design.

### B80-10119

#### JIG FOR ASSEMBLING LARGE COMPOSITE PANELS

J. T. WATTS (McDonnell Douglas Corp.)

Aug. 1980

**LANGLEY-12394**

**Vol. 5, No. 1, p. 102**

Layup of composite panels as large as 15 by 60 ft is greatly facilitated by simple mechanism. Jig consists of flat, detachable table, and curved laminating-plate joined by rack and pinion to insure accurate registration. Vacuum holds thin plastic film to laminating-plate. Preimpregnated composite sheet is applied to plate, which is then lowered face down onto table. Release of vacuum leaves layer and film and table. Film is peeled off, and steps are repeated for next layer of laminate.

### B80-10120

#### SHAPING GRAPHITE/EPOXY STIFFENERS

J. L. CUPP (Rockwell International Corp.)

Aug. 1980

**MSC-18494**

**Vol. 5, No. 1, p. 103**

Layers of graphite/epoxy, tape stacked on ridges and in grooves of channel like ribs stiffen curved laminates. Twenty-five to 38 layers of tape on each cap and flange are vacuum-bagged into shape and then interleaved with plies of fabric to form light-weight structural members free of wrinkles and voids. Structure could be parts for cars, trucks, and other vehicles.

### B80-10121

#### FLUSH-MOUNTING TECHNIQUE FOR COMPOSITE BEAMS

T. C. HARMAN (United Technologies Corp.) and B. F. KAY (United Technologies Corp.)

Aug. 1980

**LANGLEY-12389**

**Vol. 5, No. 1, p. 104**

Procedure permits mounting of heavy parts to surface of composite beams without appreciably weakening beam web. Web is split and held apart in region where attachment is to be made by lightweight precast foam filler. Bolt hole penetrates foam rather than web, and is secured by barrelnut in transverse bushing through web.

### B80-10122

#### EXAMINING GRAPHITE REINFORCEMENT IN COMPOSITES

R. E. SANDERS (Rockwell International Corp.) and C. I. YATES (Rockwell International Corp.)

Aug. 1980

**MSC-19594**

**Vol. 5, No. 1, p. 104**

Structure of graphite layers in composite parts can be checked by pyrolyzing epoxy portion of composite samples. After 2-3 hours in nitrogen atmosphere at 540 C, only graphite fibers remain. These can be separated and checked for proper number, thickness, and orientation.

### B80-10123

#### CRYOGENIC MACHINING OF POLYURETHANE FOAM

E. A. MOSHEY (RCA) and P. PRYCHKA (RCA)

Aug. 1980

**MSC-18572**

**Vol. 5, No. 1, p. 105**

Low-density foam can be machined precisely while frozen. Liquid nitrogen cools foam and aluminum heat sink prior to machining. Heat sink keeps part frozen during entire machining operation.

### B80-10124

#### 'GRINDING' CAVITIES IN POLYURETHANE FOAM

J. R. BROWER (Rockwell International Corp.), R. E. DAVEY (Rockwell International Corp.), W. F. DIXON (Rockwell Interna-

tional Corp.), P. H. ROBB (Rockwell International Corp.), and P. P. ZEBUS (Rockwell International Corp.)

Aug. 1980

**MSC-18564**

**Vol. 5, No. 1, p. 105**

Grinding tool installed on conventional milling machine cuts precise cavities in foam blocks. Method is well suited for prototype or midsize production runs and can be adapted to computer control for mass production. Method saves time and materials compared to bonding or hot wire techniques.

### B80-10125

#### ALUMINA BARRIER FOR VACUUM BRAZING

C. S. BEUYUKIAN (Rockwell International Corp.)

Aug. 1980

**MSC-18528**

**Vol. 5, No. 1, p. 106**

Heating platens of vacuum-brazing press will not stick to workpiece if aluminum oxide 'paper' is interposed. Paper does not disintegrate in press, will not contaminate braze alloy, and helps form smoothly contoured, regular fillet at brazed edges.

### B80-10126

#### CONNECTOR HEAT SHIELD

S. CLARKE (Wright Components, Inc.)

Aug. 1980

**MSC-16282**

**Vol. 5, No. 1, p. 106**

Polytetrafluoroethylene tape wrapped around electrical connectors protects them from heat damage during soldering. Tape is easily removed after contacts are joined.

### B80-10127

#### FOAM-FILLED CUSHIONS FOR SLIDING TRAYS

S. B. NAHIN (Rockwell International Corp.) and P. H. ROBB (Rockwell International Corp.)

Aug. 1980

**MSC-18565**

**Vol. 5, No. 1, p. 107**

Polytetrafluoroethylene tube filled with polyurethane foam forms low friction sliding surface that cushions vibrations and absorbs manufacturing tolerances and misalignment. Possible uses include packaging of components for shipping and seals for doors in lockers, cars, and refrigerators.

### B80-10128

#### ION-BEAM ETCHING ENHANCES ADHESIVE BONDING

B. A. BANKS, M. J. MIRTICH, and J. S. SOVEY

Aug. 1980 See also NASA-TM-79004 (N79-12909); NASA-TM-78888 (N78-24358)

**LEWIS-13028**

**Vol. 5, No. 1, p. 108**

Metals and fluoropolymers exposed to 0.5 to 1.0 keV argon ions at current densities of 0.2 to 1.5 mA/sq cm develop surface texturing that increases tensile and shear strength of epoxy bonds. Bonds are 46 to 100 percent stronger than those of chemically etched surfaces. Metals require 3 to 4 hours of bombardment to become properly textured. Fluoropolymers require 5 seconds to 30 minutes. Ion beam will not texture nickel. Unlike chemical treatments, bonding of fluoropolymers can be done days or months after ion treatment.

### B80-10129

#### ROOM-TEMPERATURE ADHESIVE FOR HIGH-TEMPERATURE USE

J. L. BROOKS (Rockwell International Corp.), W. L. HILL (Rockwell International Corp.), and C. R. ROUSSEAU (Rockwell International Corp.)

Aug. 1980

**MSC-16930**

**Vol. 5, No. 1, p. 109**

PPQ (polyphenylquinoxaline) cures at room temperature, but withstands temperatures between -186 and +402 deg C. Adhesive is applied in chloroform solution. Bond forms as solvent evaporates.

### B80-10130

#### EASILY-ASSEMBLED HELICAL HEATER

D. E. PIZZECK

Aug. 1980

**LANGLEY-11712**

**Vol. 5, No. 1, p. 110**

Rugged, compact heater is made from 0.1 mm diameter

Inconel wire (125 ohms per meter). Heating element is enclosed in PTFE heat-shrink sleeve. Ends of coil pass through small ceramic spools and are silver-brazed to lead wires. Junctions are potted in epoxy or silicon and covered with crimp sleeves and heat-shrink tubing.

**B80-10131**  
**MICROPROCESSOR SYSTEMS FOR INDUSTRIAL PROCESS CONTROL**

F. H. LESH (Caltech)

Aug. 1980

**NPO-14661** Vol. 5, No. 1, p. 110

Six computers operate synchronously and are interconnected by three independent data buses. Processors control one subsystem. Some can control buses to transfer data at 1 megabit per second. Every 2.5 msec each processor examines list of things to do during next interval. This spacecraft control system could be adapted for controlling complex industrial processes.

**B80-10132**  
**WIRE HARNESS TWISTING AID**

E. J. CASEY (Rockwell International Corp.), C. C. COMMADORE (Rockwell International Corp.), and M. E. INGLES (Rockwell International Corp.)

Aug. 1980

**MSC-18581** Vol. 5, No. 1, p. 111

Long wire bundles twist into uniform spiral harnesses with help of simple apparatus. Wires pass through spacers and through hand-held tool with hole for each wire. Ends are attached to low speed bench motor. As motor turns, operator moves hand tool away forming smooth twists in wires between motor and tool. Technique produces harnesses that generate less radio-frequency interference than do irregularly twisted cables.

**B80-10133**  
**ADJUSTABLE BASE FOR CENTERING STAKED BEARINGS**

L. A. BERSON (Rockwell International Corp.)

Aug. 1980

**MSC-19660** Vol. 5, No. 1, p. 112

Adjustable base permits housing and race to be supported separately so that unequal widths can be accounted for and bearing staked on center. If race is centered and staked on flat base and housing and race are not same width, then offset may occur and bearing will be set off center.

**B80-10134**  
**SAFELY SPLICING GLASS OPTICAL FIBERS**

K. KORBELAK (General Cable Corp.)

Aug. 1980

**KSC-11107** Vol. 5, No. 1, p. 112

Field-repair technique fuses glass fibers in flammable environment. Apparatus consists of v-groove vacuum chucks on manipulators, high-voltage dc power supply and tungsten electrodes, microscope to observe joint alignment and fusion, means of test transmission through joint. Apparatus is enclosed in gas tight box filled with inert gas during fusion. About 2 feet of fiber end are necessary for splicing.

**B80-10135**  
**KNIFE-EDGE SEAL FOR VACUUM BAGGING**

J. A. RAUSCHL (Rockwell International Corp.)

Aug. 1980

**M-FS-24049** Vol. 5, No. 1, p. 113

Cam actuated clamps pinch bagging material between long knife edge (mounted to clamps) and high temperature rubber cushion bonded to baseplate. No adhesive, tape, or sealing groove is needed to seal edge of bagging sheet against base plate.

**B80-10136**  
**A PRECOAT PREVENTS CERAMIC STOPOFFS FROM SPALLING**

A. BRENNAN (Rockwell International Corp.)

Aug. 1980

**M-FS-19495** Vol. 5, No. 1, p. 114

Nickel-alloy precoat applied with plasmagun improves

adhesion of ceramic materials applied to protect areas from unintentional brazing. Metal surface should be grit-blasted before precoating. Coating does not interfere with brazing or contaminate vacuum pumping systems.

**B80-10137**  
**SHOULD WE INDUSTRIALIZE SPACE?**

G. W. DRIGGERS (Science Applications, Inc.) and C. L. GOULD (Rockwell International Corp.)

Aug. 1980

**M-FS-23963** Vol. 5, No. 1, p. 114

Two reports project world needs over next 30 to 50 years and correlate them with space opportunities. Effects of diminishing resources, market, population, and technological changes are considered. Possible benefits are outlined.

**B80-10138**  
**COST MODELS AND ECONOMICAL PACKAGING OF LSI'S**

R. P. HIMMEL (Hughes Aircraft Co.), R. G. RAVETTI, C. W. ROTHROCK, S. M. STUHLBARG, and P. J. ZULUETA

Aug. 1980

**M-FS-25359** Vol. 5, No. 1, p. 115

Report discusses mathematical models used to estimate costs of developing and fabricating microcircuits. Second part discusses LSI packaging using tape chip carrier technology.

**B80-10139**  
**AUTOMATED ION IMPLANTATION FOR IC'S**

B. W. KENNEDY

Aug. 1980

**M-FS-25193** Vol. 5, No. 1, p. 115

Report discusses automated ion-implantation facility under development at Marshall Space Flight Center. Facility will produce ultra-reliable IC's with minimal human intervention.

**B80-10140**  
**AN AUTOMATED PHOTOLITHOGRAPHY FACILITY FOR IC'S**

B. W. KENNEDY

Aug. 1980

**M-FS-25073** Vol. 5, No. 1, p. 116

Report discusses subsystems that will constitute fully-automated photolithography facility for IC's. Facility being developed at Marshall Space Flight Center will produce ultrareliable IC's with minimal human intervention.

**B80-10141**  
**MODELS OF MOS AND SOS DEVICES**

J. D. GASSAWAY (Mississippi State Univ.), Q. MAHMOOD (Mississippi State Univ.), and J. D. TROTTER (Mississippi State Univ.)

Aug. 1980

**M-FS-25153** Vol. 5, No. 1, p. 116

Quarterly report describes progress in three programs: dc sputtering machine for aluminum and aluminum alloys; two dimensional computer modeling of MOS transistors; and development of computer techniques for calculating redistribution diffusion of dopants in silicon on sapphire films.

**B80-10260**  
**PHOTONITRIDE PASSIVATING COATING FOR IC'S**

T. C. HALL and J. W. PETERS

Sep. 1980

**M-FS-25401** Vol. 5, No. 2, p. 231

Increased reliability and simplified fabrication result from postassembly preencapsulation passivation process. Photonitride reaction chamber receives silane, ammonia, and mercury from mixing manifold to form passivating coating on IC's. Photonitride layer is barrier to moisture and penetration by mobile ions, and helps to protect IC devices subjected to severe mechanical handling or circuit repair procedures. Process is compatible with variety of wire-bonded lead frame assemblies. Advantages over plasma and sputtering deposition processes are low deposition temperature and zero stray radiation and ion levels.

## 08 FABRICATION TECHNOLOGY

**B80-10261**

### **DOUBLE METALIZATION FOR VLSI**

J. D. TROTTER (Mississippi State Univ.) and T. E. WADE (Mississippi State Univ.)  
Sep. 1980

**M-FS-25149**

**Vol. 5, No. 2, p. 232**

Postsintering process increases yield of double-layer metal conductors to almost 100 percent. When wafers containing double-metalized chips are sintered, metal layers react with oxide film remaining in insulation layer holes, breaking it up so that it no longer impedes electric current. Cooling also mechanically disrupts oxide film.

**B80-10262**

### **MORE-RELIABLE SOS ION IMPLANTATIONS**

D. S. WOO (RCA Corp.)

Sep. 1980

**M-FS-25322**

**Vol. 5, No. 2, p. 232**

Conducting layer prevents static charges from accumulating during implantation of silicon-on-sapphire MOS structures. Either thick conducting film or thinner film transparent to ions is deposited prior to implantation, and gaps are etched in regions to be doped. Grounding path eliminates charge flow that damages film or cracks sapphire wafer. Prevention of charge buildup by simultaneously exposing structure to opposite charges requires equipment modifications less practical and more expensive than deposition of conducting layer.

**B80-10263**

### **OHMIC CONTACT TO GAAS SEMICONDUCTOR**

H. J. HOVEL (IBM Corp.) and J. M. WOODALL (IBM Corp.)

Sep. 1980

**LANGLEY-12466**

**Vol. 5, No. 2, p. 233**

Multimetallic layers produce stable, low-resistance contacts for p-type GaAs and p-type GaAlAs devices. Contacts present no leakage problems, and their series resistance is too small to measure at 1 Sun intensity. Ohmic contacts are stable and should meet 20-year-life requirement at 150 C for GaAs combined photothermal/photovoltaic concentrators.

**B80-10264**

### **RESISTANCE WELDING GRAPHITE-FIBER COMPOSITES**

R. T. LAMOUREUX (McDonnell Douglas Corp.)

Sep. 1980

**MSC-18534**

**Vol. 5, No. 2, p. 234**

High-strength joints are welded in seconds in carbon-reinforced thermoplastic beams. Resistance-welding electrode applies heat and pressure to joint and is spring-loaded to follow softening material to maintain contact; it also holds parts together for cooling and hardening. Both transverse and longitudinal configurations can be welded. Adhesive bonding and encapsulation are more time consuming methods and introduce additional material into joint, while ultrasonic heating can damage graphite fibers in composite.

**B80-10265**

### **ALL-INORGANIC SPARK-CHAMBER FRAME**

T. M. HESLIN

Sep. 1980

**GSFC-12354**

**Vol. 5, No. 2, p. 235**

Outgassing is reduced by using ceramic and glass materials exclusively. Frames are assembled from four beams with rabbeted ends. Only ceramic or glass adhesives are used, and printed circuit is applied by screen printing directly on beams. Inorganic frames provide stable spark-chamber operation without gas refill, useful in terrestrial gamma-ray studies, in high-energy physics research, and other applications.

**B80-10266**

### **CONTROLLING THE SHAPE OF GLASS MICROBALLOONS**

S. A. DUNN (Bjorksten Res. Labs., Inc.) and S. GUNTER (Bjorksten Res. Labs., Inc.)

Sep. 1980

**M-FS-25230**

**Vol. 5, No. 2, p. 236**

Percent yield of 'perfect' glass microballoons is increased by using microlevitating furnaces. Furnace components operate

at higher temperatures and with levitation gases that will not affect glass materials. Furnace speeds up remelting and reshaping, reducing number of rejects for laser fusion studies. Electronic sensing maintains constant pressure differential across CHS despite changing furnace pressure and temperature; control retains microballoon in stable levitating state.

**B80-10267**

### **FORMING COMPLEX CAVITIES IN CLEAR PLASTIC**

T. RILEY, G. MATUSIK, and C. CASTERLINE

Sep. 1980

**LEWIS-13412**

**Vol. 5, No. 2, p. 237**

Metal casting 'lost wax' process is used to mold plastic parts. Highly economical technique produces optically-clear components of complex shapes, which can be used in complex combustion and manifold systems.

**B80-10268**

### **SHRINKING PLASTIC TUBING AND NONSTANDARD DIAMETERS**

W. V. RUIZ (Rockwell Intern. Corp.) and C. S. THATCHER (Rockwell Intern. Corp.)

Sep. 1980

**MSC-18430**

**Vol. 5, No. 2, p. 237**

Process allows larger-than-normal postshrink diameters without splitting. Tetrafluoroethylene tubing on mandrel is supported within hot steel pipe by several small diameter coil sections. Rising temperature of mandrel is measured via thermocouple so assembly can be removed without overshrinking (and splitting) of tubing.

**B80-10269**

### **THERMAL BARRIER AND GAS SEAL**

J. O. KANE (Rockwell Intern. Corp.) and M. SURBAT (Rockwell Intern. Corp.)

Sep. 1980

**MSC-18390**

**Vol. 5, No. 2, p. 238**

Resilient baglike seal tolerates thousand-degree temperatures and accommodates small changes in gap size without losing gas-barrier properties; at same time, it maintains smooth aerodynamic surface across gap. Seal includes alumina filler backed by metal plate. Alumina-filled envelope is easily handled and installed, and can be used in high-temperature industrial processes like coal gasification and liquefaction.

**B80-10270**

### **HEAT-SHRINKABLE SLEEVE AIDS IN INSULATING UNIVERSAL JOINTS**

W. S. GREEN (Rockwell Intern. Corp.) and F. W. THOMPSON (Rockwell Intern. Corp.)

Sep. 1980

**MSC-18685**

**Vol. 5, No. 2, p. 239**

Tubing stiffens joint so that it can be aligned with spline fitting; unsleeved joint would normally droop, making it difficult to attach to splines. Sleeve technique saves time and effort when assembling nonrigid parts by making special holding tools or fixtures unnecessary. Tubing also protects joint from dust and other contamination.

**B80-10271**

### **IMPROVED PARTICULATE-SAMPLING FILTER**

A. R. HOFFMAN (Caltech) and H. W. SCHNEIDER (Caltech)

Sep. 1980

**NPO-14801**

**Vol. 5, No. 2, p. 240**

Small surface indentations entrain larger and more representative sampling than conventional petri-dish smeared with smooth layer adhesive. Filter is assembled from perforated disk and flat backing plate with sticky surface. Due to design-created currents, particulates come in contact with surface for longer time and have greater probability of being trapped. Filter is useful in air-quality monitoring at industrial sites, in mines, and in and around nuclear power plants.

**B80-10272**

### **TIME-SHAPED RF BRAZING**

J. A. STEIN (Rockwell Intern. Corp.) and M. A. VANNASSE

(Rockwell Intern. Corp.)

Sep. 1980

**MSC-18617**

**Vol. 5, No. 2, p. 240**

One RF generator is controlled from two independent work stations with aid of RF switch and simple control boxes. Brazing may be stopped manually or automatically by external brazing-temperature controller or timer in RF switch housing. Switch is air-operated with water-cooled contacts. If switch loses air pressure, generator stops transmitting power. Time-shared outlet increases utilization and productivity of costly RF generator.

**B80-10273**

**PRODUCING GAPPED-FERRITE TRANSFORMER CORES**

W. T. MCILYMAN (Caltech)

Sep. 1980

**NPO-14715**

**Vol. 5, No. 2, p. 241**

Improved manufacturing techniques make reproducible gaps and minimize cracking. Molded, unfired transformer cores are cut with thin saw and then fired. Hardened semicircular core sections are bonded together, placed in aluminum core box, and fluidized-coated. After winding is run over box, core is potted. Economical method significantly reduces number of rejects.

**B80-10274**

**PLASTIC WELDER**

J. D. BUCKLEY, R. L. FOX, and R. J. SWAIN

Sep. 1980

**LANGLEY-12540**

**Vol. 5, No. 2, p. 242**

Low-cost, self-contained, portable welder joins plastic parts by induction heating. Welder is useable in any atmosphere or in vacuum and with most types of thermoplastic; plastic components can be joined in situ. Device is applicable to aerospace industry and in automobile, furniture, and construction industries. Power requirements are easily met by battery or solar energy. In welder, toroidal inductor transfers magnetic flux through thermoplastic to screen. Heated screen causes plastic surface on either side to melt and flow into it to form joint.

**B80-10275**

**ELECTRON-BEAM WELDER CIRCLE GENERATOR**

R. K. BURLEY (Rockwell Intern. Corp.)

Sep. 1980

**M-FS-19441**

**Vol. 5, No. 2, p. 243**

Generator rotates electron beam and performs other convenient functions during welding process. Device eliminates time-consuming techniques relying heavily on operator's skill. Welding speed is varied with frequency selector, and amplitudes of x- and y-axes are varied by adjusting phase shift. Both high and low-range adjustments are available, and each axis can be separately controlled. Crosshair is provided for set-up and beam alignments.

**B80-10276**

**'FOREIGN MATERIAL' TO VERIFY ROOT FUSION IN WELDED JOINTS**

R. E. KLEINT (Rockwell Intern. Corp.)

Sep. 1980

**M-FS-19496**

**Vol. 5, No. 2, p. 243**

Foil or thin wire at weld root is used to verify weld penetration. When weld is adequate, material mixes with weld and traces of it diffuse to weld crown. Spectroscopic analysis of samples identifies foreign material and verifies root has fused. Weld roots are usually inaccessible to visual inspection, and X-ray and ultrasonic inspection techniques are not always reliable. Good results are obtained with use of gold/nickel alloy.

**B80-10277**

**TUBE-WELDER AIDS**

J. F. WEAVER (Rockwell Intern. Corp.)

Sep. 1980

**MSC-18687**

**Vol. 5, No. 2, p. 244**

Simple tools assist in setting up and welding tubes. Welder aids can be easily made to fit given tube diameter. Finished set can be used repeatedly to fix electrode-to-weld gap and mark sleeve and joint positions. Tools are readily made in tube-manufacturing plants and pay for themselves in short time in

reduced labor costs and quality control: Conventional measurements are too slow for mass production and are prone to errors.

**B80-10278**

**HONING FIXTURE FOR WELDED ELECTRODES**

R. F. NICHOLAS (Rockwell Intern. Corp.) and W. H. SCHUBERT (Rockwell Intern. Corp.)

Sep. 1980

**M-FS-19537**

**Vol. 5, No. 2, p. 244**

Fixture for refacing electrodes mounts directly on welding machine. Up-and-down movement of stone against electrode is done manually or with designed motor drive. Fixture is used in lieu of manually refinishing electrodes with emory paper or other abrasive. It produces uniformly flat, parallel electrodes in less time, saving cost on production time.

**B80-10279**

**SILICON NITRIDE PASSIVATION OF IC'S**

J. J. ERICKSON (Hughes Aircraft Co.), F. L. GEBHART (Hughes Aircraft Co.), T. C. HALL (Hughes Aircraft Co.), and J. W. PETERS (Hughes Aircraft Co.)

Sep. 1980

**M-FS-25309**

**Vol. 5, No. 2, p. 245**

Feasibility study looks at effectiveness of silicon nitride passivation coating against moisture and mobile ions. Coating was tested on CMOS microcircuits. Tests included temperature cycling, high-temperature electrical stress, and temperature and humidity exposure. Report concludes plastic-encapsulated circuits with protective coating exhibit high survival rates; it includes tables summarizing test results and figures that show effects of flexing.

**B80-10280**

**PROGRESS IN MOSFET DOUBLE-LAYER METALIZATION**

J. D. GASSAWAY (Mississippi State Univ.), J. D. TROTTER (Mississippi State Univ.), and T. E. WADE (Mississippi State Univ.)

Sep. 1980

**M-FS-25239**

**Vol. 5, No. 2, p. 246**

Report describes one-year research effort in VLSI fabrication. Four activities are described: theoretical study of two-dimensional diffusion in SOS (silicon-on-sapphire); setup of sputtering system, furnaces, and photolithography equipment; experiments on double layer metal; and investigation of two-dimensional modeling of MOSFET's (metal-oxide-semiconductor field-effect transistors).

**B80-10281**

**OPTIMIZING COSTS OF VLSI CIRCUITS**

K. B. COOK, JR. (Auburn Univ.) and D. V. KERNS, JR. (Auburn Univ.)

Sep. 1980

**M-FS-25348**

**Vol. 5, No. 2, p. 246**

Report analyzes costs of developing and producing low-production-volume, customized VLSI (very large-scale, integrated) circuits. Relationship is developed between IC cost and electronic system cost using IC cost models based on design/fabrication approach. Emphasis is on development of understanding between cost and volume for custom circuits to be used by NASA. Reliability is major cost component in models. Report is divided into five sections and includes four appendices with useful reference literature.

**B80-10282**

**AN AUTOMATED OXIDE AND DIFFUSION FACILITY FOR IC'S**

B. W. KENNEDY

Sep. 1980

**M-FS-25357**

**Vol. 5, No. 2, p. 246**

Report discusses totally-automated oxidation and diffusion facility for fabricating IC's. Several innovations are demonstrated: process controller specifically designed for semiconductor processing; automatic loading system to accept wafers from air track, insert them in quartz carrier, and place carrier on paddle for insertion into furnace; automatic unloading of wafers back onto air track; and boron diffusion using diborane.

## 08 FABRICATION TECHNOLOGY

### B80-10283

#### PREDICTING CRACK PROPAGATION

T. HU (Rockwell Intern. Corp.)

Sep. 1980

MSC-18718

Vol. 5, No. 2, p. 247

Flaw growth under load is predicted in two dimensions with Advanced Crack Propagation Predictive Analysis Program (FLAGR04). FLAGR04 accommodates variety of cracks, crack transitions, stress gradients, changes in material properties, and Willenber retardation. Program is written in FORTRAN IV for batch execution and is available for CDC and IBM machines.

### B80-10417

#### CONTOUR-MEASURING TOOL FOR COMPOSITE LAYUPS

M. J. FONTES

Jan. 1981

ARC-11246

Vol. 5, No. 3, p. 383

Simple handtool helps form contours and complex shapes from laminae of resin-impregnated fabric. Tool, which consists of yoke having ballpoint pen and spindle and gage, is placed so that it straddles model. As toll is moved, pen draws constant thickness focus that is used as template.

### B80-10418

#### A NEW FAMILY OF FIRE-RESISTANT FOAMS

J. GAGLIANI (International Harvester Co.)

Jan. 1981 See also NASA-CR-160576 (N80-22492); B78-10053

MSC-16921

Vol. 5, No. 3, p. 384

Need for lightweight flame-resistant, nonsmoking materials in interiors of spacecraft has spawned family of foams that could find applications in aircraft and other vehicles. Polyimide-based foams are being developed as resilient fillers for seat cushions, as rigid, low-density wall panels, as high-strength sheets for floors, and as thermal and acoustical insulation.

### B80-10419

#### MODIFIED FIRE-RESISTANT FOAMS FOR SEAT CUSHIONS

J. GAGLIANI (International Harvester Co.), R. LEE (International Harvester Co.), U. A. K. SORATHIA (Intern Harvester Co.), and A. L. WILCOXSON (Intern. Harvester Co.)

Jan. 1981

MSC-18704

Vol. 5, No. 3, p. 385

Modified polyimide-polymer resins are precursors for new family of resilient fire-resistant foams. Terpolyimide foams containing long-chain aliphatic diamines withstand 50,000 cycles of compression over a 200 pound load - an equivalent of 3 years of continuous use as seat cushion filler.

### B80-10420

#### ONE-STEP MICROWAVE FOAMING AND CURING

J. GAGLIANI (International Harvester Co.), R. LEE (International Harvester Co.), U. A. K. SORATHIA (International Harvester Co.), and A. L. WILCOXSON (International Harvester Co.)

Jan. 1981 See Also NASA-CR-160576(N80-22492); NASA-CR-151472 (N77-28301)

MSC-18707

Vol. 5, No. 3, p. 386

Process that combines microwave foaming and curing of polyimide precursors in single step produces fire-resistant foam slabs of much larger volume than has previously been possible. By adding selected conductive fillers to powder precursors and by using high-power microwave oven, foam slabs with dimensions in excess of 61 by 61 by 7.6 cm are made. Typical foaming and curing and curing time is 35 minutes in microwave oven with additional 1 to 2 hour postcure in conventional oven.

### B80-10421

#### RIGID FIRE-RESISTANT FOAMS FOR WALLS AND FLOORS

J. GAGLIANI (International Harvester Co.), R. LEE (International Harvester Co.), U. A. K. SORATHIA (International Harvester Co.), and A. L. WILCOXSON (International Harvester Co.)

Jan. 1981 See also NASA-CR-160576 (N80-22492); NASA-CR-151472 (N77-28301)

MSC-18708

Vol. 5, No. 3, p. 386

Previous techniques for fabricating rigid fire-resistant polyi-

mide foams by compressing already-foamed precursor have been supplanted by one-step constrained-rise process. Precursor mixed with reinforcing fillers is placed between rigid substrates that constrain expansion of foam as it is heated by microwave energy. Process works for both liquid and powder precursors and can also be adapted to attach woven fiberglass skins at same time precursor is being foamed.

### B80-10422

#### HOT FORMING GRAPHITE/POLYIMIDE STRUCTURES

R. M. BAUCOM and P. W. KIDDER (LTV)

Jan. 1981

LANGLEY-12547

Vol. 5, No. 3, p. 387

Hot forming process has been developed in which structural shapes and panels are fabricated directly from stabilized graphite/polyimide preforms. Process can be used with thermosetting polymers that have high-temperature melt phase just before final cure. This phase allows fibers to move without destroying matrix-to-fiber adhesion. One of key advantages of this process is that prestages preforms are very stable and do not require refrigerated storage.

### B80-10423

#### METHOD FOR SHAPING POLYETHYLENE TUBING

R. C. KRAMER (Rockwell International Corp.)

Jan. 1981

MSC-18771

Vol. 5, No. 3, p. 388

Method forms polyethylene plastic tubing into configurations previously only possible with metal tubing. By using polyethylene in place of copper or stain less steel tubing in low pressure systems, fabrication costs are significantly reduced. Polyethylene tubing can be used whenever low pressure tubing is needed in oil operations, aircraft and space applications, powerplants, and testing laboratories.

### B80-10425

#### FILM COATINGS FOR CONTOURED SURFACES

H. E. FLANERY (Rockwell International Corp.), R. K. FROST (Rockwell International Corp.), and A. J. OLSON (Rockwell International Corp.)

Jan. 1981

MSC-18784

Vol. 5, No. 3, p. 389

Thickness of fluorocarbon elastomer films applied in contoured shapes by vacuum forming is difficult to control at sharply curved areas. Process for spraying contoured fluorocarbon elastomer films of uniform strength and thickness has been used instead of vacuum forming to fabricate curtain covering external tank of Space Shuttle. Conventional spray equipment may be used.

### B80-10426

#### KILOVOLT VACUUM FEED THROUGH IS LESS NOISY

L. D. HOWELL (ITT)

Jan. 1981

NPO-14802

Vol. 5, No. 3, p. 390

Electrical feedthrough connects both low-voltage and high-voltage signals between cryogenic environment and 'outside world.' Developed for cooled germanium gamma-ray detector, feedthrough has especially low capacitance and low sensitivity to microphonic noise. Its high-voltage lead is free of corona discharge and electrical breakdown to at least 5 kV.

### B80-10427

#### CUTTING HOLES IN FABRIC-FACED PANELS

S. A. PETERSON (Rockwell International Corp.)

Jan. 1981

MSC-18786

Vol. 5, No. 3, p. 391

Tool has 2 carbide inserts that bore clean holes through fibrous material with knifelike slicing action. Cutting edge of insert is curved, with plane inner surface at 30 degree angle to tool axis. Drill press or hand-held drill can be used to hold cutting tool.

### B80-10428

#### SEALING MICROPORES IN THIN CASTINGS

G. A. MERSERAU (Honeywell, Inc.), G. O. NITZSCHKE (Honeywell, Inc.), H. L. OCHS (Honeywell, Inc.), and F. S. SUTCH



(Honeywell, Inc.)

Jan. 1981

**MSC-18623**

Vol. 5, No. 3, p. 391

Microscopic pores in thin-walled aluminum castings are sealed by impregnation pretreatment. Technique was developed for investment castings used in hermetically sealed chassis for electronic circuitry. Excessively high leakage rates were previously measured in some chassis.

**B80-10429**

**LIGHTWEIGHT TERMINAL BOARD**

J. D. DRECHSLER (Rockwell International Corp.) and H. EATON (Rockwell International Corp.)

Oct. 1981

**MSC-18787**

Vol. 5, No. 3, p. 393

Sandwich construction for terminal boards reduces fabrication time and produces thinner boards with better insulation consistency, better appearance, and less weight. New method also permits closer spacing of terminal posts. Method starts with thin (0.031 inch) sheet of polyimide and consists of drilling, inserting terminal posts, upsetting ends, and then bonding second sheet to upset side as continuous insulation member. Resulting sandwich is lighter and much cheaper than single board.

**B80-10430**

**TRANSISTOR PACKAGE FOR HIGH PRESSURE APPLICATIONS**

P. J. ZANTOS (Rockwell International Corp.)

Jan. 1981

**MSC-18743**

Vol. 5, No. 3, p. 393

TO63 transistor package can operate in hydraulic oil at pressures of 200 psi or greater without leakage failure if it is reinforced by alumina disk brazed to cap and terminals. This inexpensive modification has been used successfully on power transistors in hydraulic circulating-pump assemblies for Space Shuttle orbiter and should be effective in other pressurized environments, such as in oil exploration equipment.

**B80-10431**

**AUTOMATIC CHEMICAL VAPOR DEPOSITION**

B. W. KENNEDY

Jan. 1981

**M-FS-25249**

Vol. 5, No. 3, p. 393

Report reviews chemical vapor deposition (CVD) for processing integrated circuits and describes fully automatic machine for CVD. CVD proceeds at relatively low temperature, allows wide choice of film compositions (including graded or abruptly changing compositions), and deposits uniform films of controllable thickness at fairly high growth rate. Report gives overview of hardware, reactants, and temperature ranges used with CVD machine.

**B80-10432**

**CADAT LOGIC SIMULATION PROGRAM**

C. L. MITCHELL (M & S Computing, Inc.) and J. F. TAYLOR (M & S Computing, Inc.)

Jan. 1981 See also B80-10437

**M-FS-25183**

Vol. 5, No. 3, p. 394

CADAT Logic Simulation Program (LOGSIM) checks functional correctness of electronic logic circuit by simulating circuit at logic gate level. LOGSIM also checks propagation delay through logic nets and indicates any timing or 'race' problems.

**B80-10433**

**CADAT TEST PATTERN GENERATOR**

Innovator not given (M & S Computing Co.) Jan. 1981

**M-FS-25066**

Vol. 5, No. 3, p. 394

CADAT test pattern generator (TPG) aids in checkout, fault detection, and fault isolation of complex digital circuits. Time and effort of manually generating digital test patterns can be major limiting factor in effectively utilizing automatic testing. This time and effort are reduced from several months to several days by TPG.

**B80-10434**

**CADAT FIELD-EFFECT-TRANSISTOR SIMULATOR**

Innovator not given (RCA Corp.) Jan. 1981

**M-FS-25067**

Vol. 5, No. 3, p. 395

CADAT field-effect transistor simulator (FETSIM) analyzes dc and transient behavior of metal-oxide-semiconductor (MOS) circuits. Both N-MOS and P-MOS transistor configurations in either bulk of silicon-on-sapphire (SOS) technology and almost any combination of R/C elements are analyzed.

**B80-10435**

**CADAT PLACE-AND-ROUTINE IN TWO DIMENSIONS**

Innovator not given (RCA Corp.) Jan. 1981

**M-FS-25058**

Vol. 5, No. 3, p. 395

CADAT place-and-route-in-two dimensions program (PR2D) is standard-cell automatic-layout program for generating large-scale-integrated/metal-oxide-semiconductor (LSI/MOS) arrays. PR2D translates logic designer's cell interconnection requirements into physically-defined MOS chip. PR2D reads input data, searches pin data file for data on each pattern type, generates placement of patterns, and interconnects patterns. As output, it generates artwork for layouts.

**B80-10436**

**CADAT MULTIPOINT PLACEMENT AND ROUTING**

Innovator not given (RCA Corp.) Jan. 1981

**M-FS-25065**

Vol. 5, No. 3, p. 396

CADAT multipoint-in-two dimensions program (MP2D) is powerful placement and routing aid for processing double-ended cell equivalents of high-speed silicon-on-sapphire (SOS) standard-cell family. Basic purpose of MP2D is to design high-density large-integrated (LSI) arrays.

**B80-10437**

**CADAT INTEGRATED CIRCUIT MASK ANALYSIS**

Innovator not given (M & S Computing Co.) Jan. 1981 See also B80-10432

**M-FS-25054**

Vol. 5, No. 3, p. 396

CADAT System Mask Analysis Program (MAPS2) is automated software tool for analyzing integrated-circuit mask design. Included in MAPS2 functions are artwork verification, device identification, nodal analysis, capacitance calculation, and logic equation generation.

**B80-10534**

**'DENSIFIED' TILES FORM STRONGER BONDS**

R. L. DOTTS and J. W. HOLT (Rockwell International Corp.)

Apr. 1981 See also B80-10535

**MSC-18741**

Vol. 5, No. 4, p. 495

Application of colloidal silica more than doubles bond strength of ceramic tile/substrate attachments. 'Densification' process strengthens surface where tile attaches to felt strain-isolator pad, redistributing stresses and preventing failures at that point. First, isopropyl alcohol is applied to bottom tile surface. Second, aqueous mixture of cementing colloidal silica and reinforcing ball-milled silica particles is painted on tile. Finally, after drying, tile is rewaterproofed by exposure to vapors or methyltrimethoxysilane and acetic acid.

**B80-10535**

**TILE DENSIFICATION WITH TEOS**

G. M. ECORD and C. SCHOMBURG

Apr. 1981

**MSC-18737**

Vol. 5, No. 4, p. 495

Densification process uses brushed or sprayed coating of tetraethyl orthosilicate. Liquid is applied and cured in three steps: tile weight increase averages 0.15 g per square centimeter. TEOS liquid is prepared by mixing TEOS with hydrochloric acid and adding marking dye. TEOS application provides variable stiffness, strength, and penetration. Surface of tile shows no buildup and is more durable for additional coatings.

**B80-10536**

**REPAIRING HIGH-TEMPERATURE GLAZED TILES**

G. M. ECORD and C. SCHOMBURG

Apr. 1981

**MSC-18736**

Vol. 5, No. 4, p. 496

Tetraethyl orthosilicate (TEOS) mixture fills chips and cracks in glazed tile surface. Filler is made by mixing hydrolyzed TEOS.

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silicon tetraboride powder, and pulverized tile material. Repaired tiles survived testing by intense acoustic emissions, arc jets, and intense heat radiation. Repair is reliable and rapid, performed in 1-1 1/2 hours with tile in any or orientation.

### B80-10537

#### PRODUCING SILICON CONTINUOUSLY

W. M. INGLE (Motorola, Inc.), R. S. ROSLER (Motorola, Inc.), and S. THOMPSON (Motorola, Inc.)  
Apr. 1981

NPO-14796

Vol. 5, No. 4, p. 497

Fluid-bed vaporization followed by chemical vapor deposition generates large, semiconductor-grade silicon particles. Method is economical, high-volume alternative to conventional batch-processing methods. Harvested chunks, extracted in cyclone separator, are about 0.5 to 1.3 centimeters in diameter. Process is not limited to polymer feedstock; it utilizes any halosilane intermediate used in silicon production.

### B80-10538

#### MOBILE GLAZING UNIT

J. W. HOLT (Rockwell International Corp.)  
Apr. 1981 See also NASA-N81-70850

KSC-11171

Vol. 5, No. 4, p. 498

Unit programs thermal cycle from 100 to 2,300 F for firing ceramic glaze coatings on refractory surfaces in any attitude and position. Device includes control console, heater assembly, protective cover, and manipulator boom; boom places heater next to surface to be fired. Unit is industrially useful for in situ repair of ceramics and curing individual refractory blocks during furnace maintenance.

### B80-10539

#### LEARNING HIGH-QUALITY SOLDERING

W. S. READ (Caltech)  
Apr. 1981

NPO-14869

Vol. 5, No. 4, p. 499

Soldering techniques for high-reliability electronic equipment are taught in 5 day course at NASA's Jet Propulsion Laboratory. Topic covered include new circuit assembly, printed-wiring board reworking, circuit changes, wire routing, and component installation.

### B80-10540

#### ELIMINATING GAPS IN SPLIT RINGS

R. W. GOULD (Rockwell International Corp.)  
Apr. 1981

MSC-18854

Vol. 5, No. 4, p. 500

Simple installation method allows thinner, lighter tether rings than conventional procedures, saving expensive materials. Installer inverts ring with pliers before it is slid over cable, then returns it to its original position after installation. Ring is in correct orientation, and coils are tightly compressed for high reliability fastening.

### B80-10541

#### PASSIVATION LAYER FOR STEEL SUBSTRATE OF SOLAR CELL

R. J. STIRN (Caltech) and Y. M. YEH (Caltech)  
Apr. 1981

NPO-14961

Vol. 5, No. 4, p. 501

Solar cell is fabricated on commercial sheet-steel substrate passivated with tungsten layer. Layer prevents constituents of steel from interacting with semiconductor materials in MOS thin-film solar cell. Thin plating of nickel on steel improves bonding of tungsten. Use of steel as substrate reduces materials cost of solar cell construction.

### B80-10542

#### LOW-COST CONCENTRATING MIRRORS

T. R. CARROLL (Caltech)  
Apr. 1981

NPO-14962

Vol. 5, No. 4, p. 502

Parabolic concentrators used in solar-energy systems are constructed from many flat rectangular mirrors. Each mirror is elastically deformed in one dimension. Several such mirrors placed

adjacent to each other along parabolic curve form inexpensive mirror suitable for solar application.

### B80-10543

#### SPIRAL-WOUND GASKET FORMS LOW-TEMPERATURE SEAL

S. C. IRICK  
Apr. 1981

LANGLEY-12315

Vol. 5, No. 4, p. 502

Spiral-wound cryogenic gasket with one component requires no encapsulant and is easily produced with self-locking features. Seal either opens and closes or is fixed. It is made by skiving strip from circumference of disk of glass-filled material. Successive turns of strip are spirally wrapped in groove machined into one flange surface. Closing joint compresses gasket.

### B80-10544

#### ARC SPRAYING SOLDERABLE TABS TO GLASS

J. LINDMAYER (Solarex Corp.)  
Apr. 1981

NPO-14853

Vol. 5, No. 4, p. 503

Tabs suitable for electrical or mechanical connections in solar cells and integrated circuits are made by spraying technique. Solder wets copper, copper bonds to aluminum, and aluminum adheres to glass. Arc spraying is automated and integrated with encapsulation, eliminating hand tabbing, improving reliability, and reducing cost.

### B80-10545

#### BACK CONTACTS FOR SILICON-ON-CERAMIC SOLAR CELLS

T. L. SCHULLER (Honeywell, Inc.) and S. MARQUARDT (Honeywell, Inc.)  
Apr. 1981

NPO-14809

Vol. 5, No. 4, p. 504

Grooved substrate exposes back surface of photovoltaic cells, allowing dopant diffusion into surface and electrical contact. When substrate is coated successively with carbon and molten silicon, polycrystalline-silicon bridges form over grooves, but leave channels open. Best adhesion results when substrate grooves run perpendicular to direction of liquid-silicon layer and are closely spaced.

### B80-10546

#### SELF-LUBRICATING GEARSET

D. S. BINGE (RCA Corp.)  
Apr. 1981

MSC-18801

Vol. 5, No. 4, p. 504

Gearset fabricated from molybdenum sulfide filled polyimide allows attention-free operation in vacuum and at extreme temperatures. Ring gear drives pinion gear on shaft in skewed-axis arrangement. Because loads are shared among multiple meshing teeth, self-lubricating material is strong enough to accommodate high gear ratio.

### B80-10547

#### REFLECTING LAYERS REDUCE WEIGHT OF INSULATION

J. D. COLE (Rockwell International Corp.), E. D. SCHLESSINGER (Rockwell International Corp.), and H. J. ROCKOFF (Rockwell International Corp.)  
Apr. 1981

MSC-18785

Vol. 5, No. 4, p. 505

Metalized films placed between layers of fibrous material maintain equivalent thermal conductivity while cutting blanket density in half. Tests indicate that insulation with 1 lb/cu ft density with goldized films has thermal conductivity equal to 2 lb/cu ft of conventional insulation. Concept reduces weight in commercial aircraft and increases cargo space.

### B80-10548

#### LIGHTWEIGHT CRYOGENIC VESSEL

J. C. LEWIS (Caltech)  
Apr. 1981

NPO-14794

Vol. 5, No. 4, p. 505

Thin cooling jacket of recirculating liquid nitrogen is contained by relatively thin walls. Nitrogen is maintained at slight positive

pressure, unlike full atmospheric pressure of conventional Dewar design, eliminating need for evacuated insulating spaces and heavy-walled shells. Besides cryogenic applications, design keeps liquids hot when recirculating liquid hotter than nitrogen is used.

**B80-10549**

**DROP TOWER WITH NO AERODYNAMIC DRAG**

J. M. KENDALL, JR. (Caltech)

Apr. 1981

**NPO-14845**

**Vol. 5, No. 4, p. 506**

Cooling air accelerated to match velocity of falling object eliminates drag. 3 meter drop tower with suction fan and specific geometry causes air to accelerate downward at 1 g. Although cooling of molten material released from top is slow because surrounding air moves with it, drop remains nearly spherical.

**B80-10550**

**NICKEL-DOPED SILICON FOR SOLAR CELLS**

A. M. SALAMA (Caltech)

Apr. 1981

**NPO-14780**

**Vol. 5, No. 4, p. 507**

Large grain boundaries in polycrystals act as gettering centers for nickel precipitates, improving cell performance. Effects are described in report. Data on open-circuit voltage, short-circuit current, maximum power, and conversion efficiency for illuminated cells are compared with values for undoped cells. Dark forward current versus voltage is also measured for cell types.

**B80-10551**

**CADAT NETWORK TRANSLATOR**

E. R. PITTS (M&S Computing, Inc.)

Apr. 1981 See also B80-10432 - B80-10437

**M-FS-25055**

**Vol. 5, No. 4, p. 507**

Program converts cell-net data into logic-gate models for use in test and simulation programs. Input consists of either Place, Route, and Fold (PRF) or Place-and-Route-in-Two-Dimensions (PR2D) layout data deck. Output consists of either Test Pattern Generator (TPG) or Logic-Simulation (LOGSIM) logic circuitry data deck. Designer needs to build only logic-gate-model circuit description since program acts as translator. Language is FORTRAN IV.

**B80-10552**

**CADAT INTEGRATED CIRCUIT ARTWORK PROGRAM**

R. L. KVELTHAU (M&S Computing, Inc.)

Innovator not given (RCA Corp.) Apr. 1981 See also B80-10551

**M-FS-25017**

**Vol. 5, No. 4, p. 508**

Versatile, ready-to-use program (ARTWORK) converts artwork data into mask patterns. ARTWORK generates signals for controlling mask-fabricating equipment. Extensive utility package enables user to create new pattern libraries, develop and incorporate new cells, and perform systems orientation functions. Program is written in FORTRAN IV.

## 09 MATHEMATICS AND INFORMATION SCIENCES

**B80-10142**

**EFFICIENT TELEMETRY FORMAT**

E. GREENBERG (Caltech) and A. J. HOOKE (Caltech)

Aug. 1980

**NPO-13679**

**Vol. 5, No. 1, p. 119**

Format would simplify ground processing of telemetry data. Also, missing minor frame would create error in only one set of source data instead of disrupting all sets. Format organizes data from various sources into autonomous blocks. Data are pre-processed, in effect, so main computer only needs to determine block type and process data set as batch.

**B80-10143**

**USER'S GUIDE TO SFTRAN**

T. E. FESSLER and W. F. FORD

Aug. 1980

**LEWIS-13172**

**Vol. 5, No. 1, p. 119**

Structured programming language has been given new features and some limitations are removed. Language runs more efficiently, and concepts of top down development and modularity are extended to task management.

**B80-10144**

**GODDARD MISSION ANALYSIS SYSTEM**

F. E. MCGARRY

Aug. 1980

**GSFC-12392**

**Vol. 5, No. 1, p. 120**

Collection of software modules can be configured to solve variety of mission analysis problems. GMAS includes modules for performing large selection of standard mission analyses. Graphics executive system is provided. Program is in FORTRAN IV and Assembler for and interactive execution on IBM 360-series.

**B80-10145**

**SOFTWARE DESIGN AND DOCUMENTATION LANGUAGE**

H. KLEINE (Caltech)

Aug. 1980

**NPO-14610**

**Vol. 5, No. 1, p. 121**

Language supports design and documentation of complex software. Included are: design and documentation language for expressing design concepts; processor that produces intelligible documentation based on design specifications; and methodology for using language and processor to create well-structured top-down programs and documentation. Processor is written in SIMSCRIPT 11.5 programming language for use on UNIVAC, IBM, and CDC machines.

**B80-10146**

**ESTIMATION OF INCOMPLETE MULTINOMIAL DATA**

K. R. CREDEUR

Aug. 1980

**LANGLEY-12593**

**Vol. 5, No. 1, p. 121**

Program estimates cell probabilities for data observed to fall in one of two or more categories when exact category cannot be determined. Data are assumed to be randomly incomplete. Estimation minimizes risk of quadratic loss. Program should be useful in projects where multinomial data is analyzed, but where observations are sometimes incomplete. Program is in FORTRAN IV and Assembler for batch execution on CYBER 173.

**B80-10147**

**AUTOMATED FLOW-CHART SYSTEM**

W. WOODFORD

Aug. 1980

**GSFC-12514**

**Vol. 5, No. 1, p. 121**

Program produces flow chart of any program written in FORTRAN. Each FORTRAN statement is printed with symbol representing actions required during execution. Flow chart is generated on line-printer. This program is in COBOL for batch execution on IBM 370-series computer.

**B80-10148**

**SYSTEMS IMPROVED NUMERICAL DIFFERENCING ANALYZER**

Innovator not given (Johnson Space Center) Aug. 1980

**MSC-18597**

**Vol. 5, No. 1, p. 122**

Program solves physical problems governed by diffusion-type equations, provided that equations can be modeled by lumped-parameter representation. Program is used for thermal analysis, and could be adapted to solve Fourier, Poisson, and Laplace differential equations. Program is in FORTRAN IV and Assembler for execution on UNIVAC 1100-series or CYBER 175.

**B80-10284**

**AN APPROXIMATION TO STUDENT'S T-DISTRIBUTION**

D. R. RUMMLER and C. W. STODD

Sep. 1980

**LANGLEY-12238**

**Vol. 5, No. 2, p. 251**

## 09 MATHEMATICS AND INFORMATION SCIENCES

Three equations relate Student's t-distribution to standard normal distribution with maximum error of less than 0.8 percent. First equation, used for degrees of freedom (v) greater than 2, expresses t variable in terms of standard normal variable z. For v=1 and 2, second and third equations express t exactly in terms of probability P.

**B80-10285**

### **LOW-COST LANDSAT PROCESSING SYSTEM**

N. L. FAUST (Metrics, Inc.), N. J. HOOPER (Metrics, Inc.), and G. W. SPANN (Metrics, Inc.)

Sep. 1980

**M-FS-25396**

**Vol. 5, No. 2, p. 252**

LANDSAT analysis system is assembled from commercially available components at relatively low cost. Small-scale system is put together for price affordable for state agencies and universities. It processes LANDSAT data for subscene areas on repetitive basis. Amount of time required for processing decreases linearly with number of classifications desired. Computer programs written in FORTRAN IV are available for analyzing data.

**B80-10286**

### **NASA PERT TIME II**

R. C. BAINBRIDGE, F. FUNICELLI, D. J. HIRSCH, E. A. PALLAT, E. RYAN, J. D. WALKER, and H. BREMMER

Sep. 1980

**LEWIS-13145**

**Vol. 5, No. 2, p. 252**

Program Evaluation and Review Technique (PERT) is disciplined management technique involving computer processing. NASA PERT Time II gives project manager insight into current and future project development and forewarns of potential problems. Program utilizes modular technique. Module is 'fragnet'; once aspects of project are described in terms of fragnets, control network is automatically generated. Program is written in FORTRAN IV and OS Assembler for batch execution and has been implemented on IBM 370.

**B80-10287**

### **LINEAR STOCHASTIC OPTIMAL CONTROL AND ESTIMATION PROBLEM**

L. C. GEYSER and F. K. B. LEHTINEN

Sep. 1980

**LEWIS-13206**

**Vol. 5, No. 2, p. 253**

Problem involves design of controls for linear time-invariant system disturbed by white noise. Solution is Kalman filter coupled through set of optimal regulator gains to produce desired control signal. Key to solution is solving matrix Riccati differential equation. LSOCE effectively solves problem for wide range of practical applications. Program is written in FORTRAN IV for batch execution and has been implemented on IBM 360.

**B80-10288**

### **MULTIPLE LINEAR REGRESSION ANALYSIS**

T. R. EDWARDS

Sep. 1980

**M-FS-23764**

**Vol. 5, No. 2, p. 254**

Program rapidly selects best-suited set of coefficients. User supplies only vectors of independent and dependent data and specifies confidence level required. Program uses stepwise statistical procedure for relating minimal set of variables to set of observations; final regression contains only most statistically significant coefficients. Program is written in FORTRAN IV for batch execution and has been implemented on NOVA 1200.

**B80-10289**

### **STRUCTURED FORTRAN PREPROCESSOR**

S. AUSTIN (Science Applications, Inc.), B. BUCKLES (Science Applications, Inc.), and J. P. RYAN (Science Applications, Inc.)

Sep. 1980

**M-FS-23713**

**Vol. 5, No. 2, p. 254**

Structured-programming features simplify software design. Programmer needs only few control statements to code program in format easy to debug and maintain, freeing him/her from flow constraints of standard FORTRAN. Program is written in ANSI FORTRAN and is compatible with machine supporting

FORTRAN compiler that accepts ANSI statements. It has been implemented on IBM 370.

**B80-10290**

### **MBASIC PROCESSOR**

R. B. HARTLEY (Caltech) and R. E. HOLZMAN (Caltech)

Sep. 1980

**NPO-14245**

**Vol. 5, No. 2, p. 254**

MBASIC is high-level, interactive computer language that reduces time of computer task programming. Outstanding features of MBASIC include: multiple assignments or statements in single instruction; conditional, assignment, and repetitive statement modifiers; and excellent string-handling capabilities. Two machine versions are available: UNIVAC (written in reentrant Assembler code for execution under EXEC 8) AND DEC-10 (written in Assembler code for execution under TOPS-10).

**B80-10291**

### **BASIC CLUSTER COMPRESSION ALGORITHM**

E. E. HILBERT (Caltech) and J. LEE (Caltech)

Sep. 1980

**NPO-14816**

**Vol. 5, No. 2, p. 255**

Feature extraction and data compression of LANDSAT data is accomplished by BCCA program which reduces costs associated with transmitting, storing, distributing, and interpreting multispectral image data. Algorithm uses spatially local clustering to extract features from image data to describe spectral characteristics of data set. Approach requires only simple repetitive computations, and parallel processing can be used for very high data rates. Program is written in FORTRAN IV for batch execution and has been implemented on SEL 32/55.

**B80-10292**

### **SYSTEM TIME-DOMAIN SIMULATION**

C. T. DAWSON, T. W. EGGLESTON, A. C. GORIS, M. FASHANO (Hughes Aircraft Co.), D. PAYNTER (Hughes Aircraft Co.), and W. H. TRANTER (Missouri Univ.)

Sep. 1980

**MSC-18333**

**Vol. 5, No. 2, p. 255**

Complex systems are simulated by engineers without extensive computer experience. Analyst uses free-form engineering-oriented language to input 'black box' description. System Time Domain (SYSTID) Simulation Program generates appropriate algorithms and proceeds with simulation. Program is easily linked to postprocessing routines. SYSTID program is written in FORTRAN IV for batch execution and has been implemented on UNIVAC 1110 under control of EXEC 8, Level 31.

**B80-10293**

### **IMAGE-BASED INFORMATION, COMMUNICATION, AND RETRIEVAL**

N. A. BRYANT (Caltech) and A. L. ZOBRIST (Caltech)

Sep. 1980

**NPO-14893**

**Vol. 5, No. 2, p. 256**

IBIS/VICAR system combines video image processing and information management. Flexible programs require user to supply only parameters specific to particular application. Special-purpose input/output routines transfer image data with reduced memory requirements. New application programs are easily incorporated. Program is written in FORTRAN IV, Assembler, and OS JCL for batch execution and has been implemented on IBM 360.

**B80-10438**

### **AN IMAGE-DATA-COMPRESSION ALGORITHM**

E. E. HILBERT (Caltech) and R. F. RICE (Caltech)

Jan. 1981

**NPO-14496**

**Vol. 5, No. 3, p. 399**

Cluster Compression Algorithm (CCA) preprocesses LANDSAT image data immediately following satellite data sensor (receiver). Data are reduced by extracting pertinent image features and compressing this result into concise format for transmission to ground station. This results in narrower transmission bandwidth, increased data-communication efficiency, and reduced computer time in reconstructing and analyzing image. Similar technique could be applied to other types of recorded data to cut costs of

transmitting, storing, distributing, and interpreting complex information.

**B80-10439**  
**DETERMINING MANUFACTURING COST FROM PRODUCT COMPLEXITY**

L. M. DELIONBACK

Jan. 1981

**M-FS-25371**

**Vol. 5, No. 3, p. 400**

Procedure allows calculation of manufacturing complexity - the totality of cost elements that determine cost of manufacturing unit. Procedure is based on premise that manufacturing follows learning curve; that is costs are assumed to decrease as experience is acquired and improvements are made in design, tooling, and methods.

**B80-10553**  
**AN APPROXIMATION FOR INVERSE LAPLACE TRANSFORMS**

W. M. LEAR (TRW, Inc.)

Apr. 1981 See also NASA-TM-81064(N80-25056)

**MSC-18867**

**Vol. 5, No. 4, p. 511**

Programmable calculator runs simple finite-series approximation for Laplace transform inversions. Utilizing family of orthonormal functions, approximation is used for wide range of transforms, including those encountered in feedback control problems. Method works well as long as  $F(t)$  decays to zero as it approaches infinity and so is applicable to most physical systems.

**B80-10554**  
**SAFETY ANALYSIS FOR COMPLEX SYSTEMS**

J. P. ONESTY (Rockwell International Corp.) and R. L. PEERCY, JR. (Rockwell International Corp.)

Apr. 1981

**MSC-18745**

**Vol. 5, No. 4, p. 511**

Operational risk assessment considers hardware, environment, and human factors. Technique starts with division of postulated mission into segments which are further subdivided into separate operational steps. Consequences of steps, nonoccurrence, premature operation, out-of-sequence operation, and inadvertent execution are examined at subevent, event, and phase levels. Hazards are identified and treated individually. Analysis is well suited to application in energy and transportation fields.

**B80-10555**  
**EVALUATING COMPUTER-DRAWN GROUND-COVER MAPS**

L. G. ARVANITIS (Univ. of Florida), R. NEWBURNE (Univ. of Florida), and R. REICH (Univ. of Florida)

Apr. 1981 See also NASA-CR-154635(N80-32805)

**KSC-11195**

**Vol. 5, No. 4, p. 512**

Computer-generated character maps from LANDSAT data are compared to aerial photos for test sites in Florida. Report Describes extraction of ground features by two analytical techniques: unsupervised clustering algorithm, called LANDSAT Signature Development Program (LSDP), and interactive algorithm based on multispectral image analyzer. Study concluded that computer classification of digital LANDSAT multispectral data, supplemented with certain ground-cover information, is valuable tool for analysis of renewable resources.

**B80-10556**  
**OCCULT-ORSER COMPLETE CONVERSATIONAL USER-LANGUAGE TRANSLATOR**

H. K. RAMAPRIYAN and K. YOUNG (Computer Science Corp.)

Apr. 1981

**GSFC-12604**

**Vol. 5, No. 4, p. 512**

Translator program (OCCULT) assists non-computer-oriented users in setting up and submitting jobs for complex ORSER system. ORSER is collection of image processing programs for analyzing remotely sensed data. OCCULT is designed for those who would like to use ORSER but cannot justify acquiring and maintaining necessary proficiency in Remote Job Entry Language, Job Control Language, and control-card formats. OCCULT is written in FORTRAN IV and OS Assembler for interactive execution.

**B80-10557**  
**SELECTING OPTIMUM ALGORITHMS FOR IMAGE PROCESSING**

R. R. JAROE, J. HODGES, R. E. ATKINSON, B. GAGGINI, L. CALLAS, and J. PETERSON

Apr. 1981

**M-FS-25367**

**Vol. 5, No. 4, p. 513**

Collection of registration, compression, and classification algorithms allows users to evaluate approaches and select best one for particular application. Program includes six registration algorithms, six compression algorithms, and two classification algorithms. Package also includes routines for evaluating effects of processing on image data. Collection is written in FORTRAN IV for batch execution.

**B80-10558**  
**A UNIVERSAL STRUCTURED-DESIGN DIAGRAMMER**

Innovator not given (Higher Order Software, Inc.) Apr. 1981

**LANGLEY-12548**

**Vol. 5, No. 4, p. 513**

Program (FLOWCHARTER) generates standardized flowcharts and concordances for development and debugging of programs in any language. User describes programming-language grammar, providing syntax rules in Backus-Naur form (BNF), list of semantic rules, and set of concordance rules. Once grammar is described, user supplies only source code of program to be diagrammed. FLOWCHARTER automatically produces flow diagram and concordance. Source code for program is written for PASCAL Release 2 compiler, as distributed by University of Minnesota.

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 Compact table-tilting mechanism  
 NPO-14800 B80-10411 07

**ATTITUDE CONTROL**

- Aircraft equilibrium spin characteristics  
 LANGLEY-12502 B80-10087 06  
 The 3-D guidance system with proximity sensors  
 NPO-14521 B80-10250 07

**AUGMENTATION**

- Digital enhancement of X-rays for NDT  
 KSC-11118 B80-10232 06

**AUTOMATIC CONTROL**

- Computer-controlled warmup circuit  
 NPO-14815 B80-10155 01  
 Automatic thermal switches  
 GSFC-12553 B80-10214 06  
 Automatic 35 mm slide duplicator  
 LEWIS-13399 B80-10249 07  
 Automatic chemical vapor deposition  
 M-FS-25249 B80-10431 08

**AUTOMATIC CONTROL VALVES**

- Automatic shutoff valve  
 MSC-19385 B80-10097 07

**AUTOMATIC FREQUENCY CONTROL**

- Ultrastable automatic frequency control  
 MSC-18679 B80-10294 01

**AUTOMATIC GAIN CONTROL**

- Fiber optics transmit clock signal more reliably  
 NPO-14749 B80-10456 03

**AUTOMATIC PILOTS**

- Electrofluidic accelerometer  
 LANGLEY-12493 B80-10225 06

**AUTOMATIC TEST EQUIPMENT**

- Developing experiment instrument packages  
 GSFC-12536 B80-10451 02  
 Solar-site test module  
 M-FS-25543 B80-10460 03

**AUTOMOBILE ENGINES**

- Reduced hydrogen permeability at high temperatures  
 LEWIS-13485 B80-10364 04

**AUTOMOBILES**

- Four-wheel dual braking for automobiles  
 LANGLEY-12687 B80-10529 07

**AVALANCHE DIODES**

- Semiconductor step-stress testing  
 M-FS-25329 B80-10011 01  
 JANTX1N2970B zener diode  
 M-FS-25260 B80-10012 01  
 JANTX1N2989B zener diode  
 M-FS-25261 B80-10013 01  
 JANTX1N3016B zener diode  
 M-FS-25262 B80-10014 01  
 JANTX1N3031B zener diode  
 M-FS-25263 B80-10015 01

**AXISYMMETRIC BODIES**

- Predicting propulsion system drag  
 LANGLEY-12619 B80-10238 06  
 Inviscid transonic flow over axisymmetric bodies  
 LANGLEY-12499 B80-10398 06

**B****BAGS**

- Soft container for explosive nuts  
 MSC-18871 B80-10532 07

**BALL BEARINGS**

- Measuring ball-bearing loads  
 M-FS-19505 B80-10102 07

**BALLOONS**

- Controlling the shape of glass microballoons  
 M-FS-25230 B80-10266 08

**BALLS**

Ball-joint grounding ring  
MSC-18824 B80-10405 07

**BANDPASS FILTERS**

Continuous control of phase-locked-loop  
bandwidth  
MSC-16684 B80-10008 01

**BANDWIDTH**

Continuous control of phase-locked-loop  
bandwidth  
MSC-16684 B80-10008 01

**BASIC (PROGRAMMING LANGUAGE)**

MBASIC processor  
NPO-14245 B80-10290 09

**BATTERY CHARGERS**

Improved battery charger for electric  
vehicles  
NPO-14964 B80-10440 01

**BEADS**

Eliminating underbead fissuring in  
superalloys  
M-FS-19460 B80-10114 08

**BEAMS (SUPPORTS)**

Automatic connector for structural  
beams  
M-FS-25134 B80-10094 07  
Flush-mounting technique for composite  
beams  
LANGLEY-12389 B80-10121 08  
Resistance welding graphite-fiber  
composites  
MSC-18534 B80-10264 08

**BEARINGS**

Measuring ball-bearing loads  
M-FS-19505 B80-10102 07  
Adjustable base for centering staked  
bearings  
MSC-19660 B80-10133 08  
Rotor transient analysis  
LEWIS-13230 B80-10259 07  
Cylindrical bearing analysis  
LEWIS-13393 B80-10533 07

**BELLOWS**

A versatile tunnel acts as a flexible  
duct  
M-FS-22636 B80-10242 07

**BENDING**

Tension-mode loading for bend  
specimens in cryogenics  
LEWIS-13040 B80-10076 06  
Method for shaping polyethylene tubing  
MSC-18771 B80-10423 08

**BERYLLIUM COMPOUNDS**

Ball-joint grounding ring  
MSC-18824 B80-10405 07

**BIAS**

Temperature-compensating dc restorer  
LANGLEY-12549 B80-10152 01

**BINARY ALLOYS**

Diffusion in single-phase binary alloys  
LANGLEY-12665 B80-10498 04

**BIOINSTRUMENTATION**

Cardiopulmonary data-acquisition  
system  
MSC-18783 B80-10499 05  
Microprocessor-based cardiometer  
MSC-18775 B80-10501 05

**BIOMEDICAL DATA**

Flow sensor for biomedical fluids  
MSC-18761 B80-10367 05  
Microprocessor-based cardiometer  
MSC-18775 B80-10501 05

**BIOTELEMETRY**

Miniaturized physiological data telemetry  
system  
MSC-18804 B80-10371 05

**BIREFRINGENCE**

Acoustically-tuned optical spectrometer  
HQN-10924 B80-10326 03

**BLADES (CUTTERS)**

Cutting holes in fabric-faced panels  
MSC-18786 B80-10427 08

**BLOOD VESSELS**

Compliant transducer measures artery  
profile  
NPO-14899 B80-10369 05

**BOLTS**

Eddy-current sensor measures bolt  
loading  
M-FS-19486 B80-10079 06  
Bolt-tension indicator  
M-FS-19324 B80-10105 07  
Two-headed bolt  
M-FS-19619 B80-10410 07

**BONDING**

'Densified' tiles form stronger bonds  
MSC-18741 B80-10534 08  
Tile densification with TEOS  
MSC-18737 B80-10535 08  
Arc spraying solderable tabs to glass  
NPO-14853 B80-10544 08

**BORING MACHINES**

Cutting holes in fabric-faced panels  
MSC-18786 B80-10427 08

**BOUNDARY LAYER STABILITY**

Disturbance amplification rates  
LANGLEY-12556 B80-10092 06

**BRAKES (FOR ARRESTING MOTION)**

Four-wheel dual braking for  
automobiles  
LANGLEY-12687 B80-10529 07  
Gentle arrester for moving bodies  
LANGLEY-12372 B80-10531 07

**BRAYTON CYCLE**

Gas absorption/desorption  
temperature-differential engine  
NPO-14528 B80-10513 06

**BRAZING**

Alumina barrier for vacuum brazing  
MSC-18528 B80-10125 08  
A precoat prevents ceramic stopoffs from  
spalling  
M-FS-19495 B80-10136 08  
Time-shaped RF brazing  
MSC-18617 B80-10272 08  
Time-sharing switch for vacuum brazing  
MSC-18699 B80-10412 07

**BUBBLES**

Removal of hydrogen bubbles from  
nuclear reactors  
LANGLEY-12597 B80-10205 04  
Driving bubbles out of glass  
M-FS-25414 B80-10496 04

**BUFFER STORAGE**

Online assessment of a distributed  
processor  
KSC-11124 B80-10037 02  
Common data buffer  
KSC-11048 B80-10303 02

**BUNDLES**

Handtool assists in bundling cables  
MSC-18567 B80-10255 07

**BUS CONDUCTORS**

Detecting short circuits during  
assembly  
ARC-11116 B80-10007 01

**C****CABLES (ROPES)**

Gentle arrester for moving bodies  
LANGLEY-12372 B80-10531 07

**CALIBRATING**

Broadband electrostatic acoustic  
transducer for liquids  
LANGLEY-12465 B80-10078 06  
Optical calibrator for TDL  
spectrometers  
GSFC-12562 B80-10178 03  
Low-cost calibration of acoustic  
locators  
LANGLEY-12632 B80-10185 03  
A temperature fixed point near 58 C  
M-FS-25304 B80-10204 04  
Portable zero-delay assembly  
NPO-14671 B80-10316 02  
Fast calibration of gas flowmeters  
KSC-11076 B80-10516 06

**CAMERAS**

Camera add-on records time of  
exposure  
LANGLEY-12635 B80-10183 03

**CAPACITANCE SWITCHES**

Fast response cryogen level sensor  
MSC-18697 B80-10374 06

**CAPACITIVE FUEL GAGES**

Fast response cryogen level sensor  
MSC-18697 B80-10374 06

**CAPACITORS**

Measuring radiation effects on MOS  
capacitors  
NPO-14700 B80-10227 06

**CARBON**

Carbon scrubber  
MSC-16531 B80-10356 04

**CARBON DIOXIDE LASERS**

Tunable pulsed carbon dioxide laser  
NPO-14984 B80-10458 03

**CARBON FIBER REINFORCED PLASTICS**

Examining graphite reinforcement in  
composites  
MSC-19594 B80-10122 08

**CARDIOTACHOMETERS**

Microprocessor-based cardiometer  
MSC-18775 B80-10501 05

**CARDIOVASCULAR SYSTEM**

Cardiopulmonary data-acquisition  
system  
MSC-18783 B80-10499 05  
Microprocessor-based cardiometer  
MSC-18775 B80-10501 05

**CARTRIDGES**

Quick mixing of epoxy components  
MSC-18731 B80-10415 07

**CASTING**

Forming complex cavities in clear  
plastic  
LEWIS-13412 B80-10267 08

**CASTINGS**

Predicting lifetime of cast parts  
M-FS-19549 B80-10228 06  
Sealing micropores in thin castings  
MSC-18623 B80-10428 08

**CATALYSTS**

Improved cell for water-vapor  
electrolysis  
MSC-16394 B80-10489 04  
Photoproduction of halogens using  
platinized TiO<sub>2</sub>  
LANGLEY-12713 B80-10491 04



**CATHETOMETERS**

Improved ureteral stone fragmentation catheter  
NPO-14745 880-10370 05

**CATHODE RAY TUBES**

Real-time film recording from stroke-written CRT's  
LANGLEY-12529 880-10169 02

**CAVITATION FLOW**

Dynamics of cavitating cascades and inducer pumps  
M-FS-25399 880-10392 06

**CAVITIES**

Downhole pressure sensor  
NPO-14729 880-10223 06  
Forming complex cavities in clear plastic  
LEWIS-13412 880-10267 08

**CAVITY RESONATORS**

Cavity-backed spiral-slot antenna  
MSC-18532 880-10448 02

**CENTRAL PROCESSING UNITS**

Microprocessor-controlled data synchronizer  
MSC-18535 880-10031 02  
Common data buffer  
KSC-11048 880-10303 02

**CERAMIC COATINGS**

Corrosion-resistant ceramic thermal barrier coating  
LEWIS-13088 880-10067 04  
A precoat prevents ceramic stopoffs from spalling  
M-FS-19495 880-10136 08  
Mobile glazing unit  
KSC-11171 880-10538 08

**CERAMICS**

'Densified' tiles form stronger bonds  
MSC-18741 880-10534 08

**CHARGE COUPLED DEVICES**

Better-quality CCD-array images  
NPO-14426 880-10168 02  
Four-quadrant CCD analog multiplier  
LANGLEY-12332 880-10305 02  
Monolithic four-quadrant multiplier  
LANGLEY-12330A 880-10306 02  
Monolithic CCD-array readout  
LANGLEY-12376 880-10307 02

**CHARGE DISTRIBUTION**

Crossed-grid charge locator  
M-FS-25170 880-10010 01  
NASA charging analyzer program  
LEWIS-12973 880-10058 03

**CHARGED PARTICLES**

NASA charging analyzer program  
LEWIS-12973 880-10058 03

**CHARRING**

Heat resistant polyphosphazene polymers  
ARC-11176 880-10350 04  
Resin char oxidation retardant for composites  
LEWIS-13275 880-10354 04  
High char yield epoxy curing agents  
LEWIS-13226 880-10361 04

**CHEMICAL ANALYSIS**

Simultaneous measurement of three atmospheric pollutants  
NPO-14828 880-10359 04

**CHEMICAL MACHINING**

Chemical-milling solution for invar alloy  
M-FS-25365 880-10113 08

**CHEMICAL REACTIONS**

Methane/air flames in a concentric tube combustor  
LEWIS-13388 880-10211 04

**CHEMICAL REACTORS**

Producing silicon continuously  
NPO-14796 880-10537 08

**CHLOROPHYLLS**

Laser-fluorescence measurement of marine algae  
LANGLEY-12282 880-10213 05

**CIRCLES (GEOMETRY)**

Electron-beam welder circle generator  
M-FS-19441 880-10275 08

**CIRCUIT BOARDS**

Low-resistance continuity tester  
NPO-14881 880-10445 01

**CIRCUIT PROTECTION**

Simple circuit monitors 'third wire' in ac lines  
M-FS-19457 880-10002 01  
Voltage controller/current limiter for ac  
NPO-13061 880-10032 02  
Cooling/grounding mount for hybrid circuits  
MSC-18728 880-10302 01

**CIRCULAR POLARIZATION**

Antenna feed for linear and circular polarization  
NPO-14810 880-10297 01

**CLAMPS**

Vise holds specimens for microscope  
MSC-18690 880-10098 07  
Drill-motor holding fixture  
MSC-18582 880-10108 07  
Lock for hydraulic actuators  
MSC-18853 880-10530 07  
Eliminating gaps in split rings  
MSC-18854 880-10540 08

**CLEANERS**

Removing freon gas from hydraulic fluid  
MSC-18740 880-10494 04

**CLEANING**

Ion-beam cleaning for cold welds  
LEWIS-12982 880-10115 08

**CLEARANCES**

Adjustable base for centering staked bearings  
MSC-19660 880-10133 08

**CLEAVAGE**

Cleaving machine for hard crystals  
GSFC-12584 880-10401 07

**CLOCKS**

Fiber optics transmit clock signal more reliably  
NPO-14749 880-10456 03

**CLOSURES**

Clamshell door system  
MSC-18468 880-10101 07

**CLOUD COVER**

Instrument measures cloud cover  
NPO-14936 880-10514 06

**CLOUDS**

Instrument measures cloud cover  
NPO-14936 880-10514 06

**CLOUDS (METEOROLOGY)**

Instrument measures cloud cover  
NPO-14936 880-10514 06

**COAL**

Measuring coal deposits by radar  
M-FS-23922 880-10060 04  
Detecting a coal/shale interface  
M-FS-23720 880-10061 04  
Underground Coal Mining  
NPO-14704 880-10071 04  
Position monitor for mining machines  
M-FS-25342 880-10157 01

**COAL GASIFICATION**

Coal conversion and synthetic-fuel production  
M-FS-25330 880-10070 04

**COATING**

Spraying suspensions uniformly  
M-FS-25139 880-10409 07

**COATINGS**

Coatings for hybrid microcircuits  
M-FS-25292 880-10116 08  
Fluorescent radiation converter  
GSFC-12528 880-10180 03  
Selective optical coatings for solar collectors  
M-FS-23589 880-10192 03  
Improved adherence of TiC coatings to steel  
LEWIS-13169 880-10207 04  
Photonitride passivating coating for IC's  
M-FS-25401 880-10260 08  
Low cost high temperature, duplex coating for superalloys  
LEWIS-13497 880-10352 04  
Improved metallic and thermal barrier coatings  
LEWIS-13324 880-10353 04  
Film coatings for contoured surfaces  
MSC-18784 880-10425 08  
User chooses coating properties  
LANGLEY-12719 880-10493 04

**CODING**

Structured FORTRAN preprocessor  
M-FS-23813 880-10289 09  
Converting a digital filter to its analog equivalent  
MSC-18587 880-10313 02

**COINCIDENCE CIRCUITS**

Multichannel coincidence circuit  
LANGLEY-12531 880-10005 01

**COLD WELDING**

Ion-beam cleaning for cold welds  
LEWIS-12982 880-10115 08

**COLLIMATORS**

Multibeam collimator uses prism stack  
GSFC-12608 880-10452 03

**COLLOIDS**

Reducing static charges in fluidized bed reactions  
ARC-11245 880-10068 04

**COLUMNS (SUPPORTS)**

Mechanical end joint for structural columns  
LANGLEY-12482 880-10095 07  
Automatic connector joins structural columns  
LANGLEY-12578 880-10251 07

**COMBUSTION CHAMBERS**

Methane/air flames in a concentric tube combustor  
LEWIS-13388 880-10211 04  
Flashback-free combustor  
LANGLEY-12666 880-10226 06

**COMBUSTION PHYSICS**

Automated holographic drop-size analyzer  
880-10181 03

**COMMUNICATION CABLES**

Handtool assists in bundling cables  
MSC-18567 880-10255 07

**COMMUNICATION EQUIPMENT**

Multiband microstrip antenna  
MSC-18334 880-10001 01  
Receiving signals of any polarization  
NPO-14836 880-10315 02  
Miniaturized physiological data telemetry system  
MSC-18804 880-10371 05

**COMPLEX SYSTEMS**

Safety analysis for complex systems  
MSC-18745 880-10554 09

**COMPONENT RELIABILITY**

Semiconductor step-stress testing  
M-FS-25329 880-10011 01  
JANTX1N2970B zener diode  
M-FS-25260 880-10012 01  
JANTX1N2989B zener diode  
M-FS-25261 880-10013 01  
JANTX1N3016B zener diode  
M-FS-25262 880-10014 01  
JANTX1N3031B zener diode  
M-FS-25263 880-10015 01  
JANTX1N5622 diode  
M-FS-25280 880-10016 01  
JANTX1N5623 switching diode  
M-FS-25281 880-10017 01  
JANTX2N2060 dual transistor  
M-FS-25251 880-10018 01  
JANTX2N2219A dual transistor  
M-FS-25252 880-10019 01  
JANTX2N2369A transistor  
M-FS-25254 880-10020 01  
JANTX2N2432A transistor  
M-FS-26255 880-10021 01  
JANTX2N2484 transistor  
M-FS-25253 880-10022 01  
JANTX2N2605 transistor  
M-FS-25150 880-10023 01  
JANTX2N2905A transistor  
M-FS-25256 880-10024 01  
JANTX2N2920 Dual transistor  
M-FS-25258 880-10025 01  
JANTX2N2945A transistor  
M-FS-25259 880-10026 01  
JANTX2N3637 transistor  
M-FS-25264 880-10027 01  
JANTX2N3811 dual transistor  
M-FS-25265 880-10028 01  
JANTX2N4150 transistor  
M-FS-25267 880-10029 01  
JANTX2N4856 field-effect transistor  
M-FS-25269 880-10030 01

**COMPOSITE MATERIALS**

Jig for assembling large composite panels  
LANGLEY-12394 880-10119 08  
Shaping graphite/epoxy stiffeners  
MSC-18494 880-10120 08  
Flush-mounting technique for composite beams  
LANGLEY-12389 880-10121 08  
Examining graphite reinforcement in composites  
MSC-19594 880-10122 08  
Knife-edge seal for vacuum bagging  
M-FS-24049 880-10135 08  
Plasticizer for polyimide composites  
LANGLEY-12642 880-10206 04  
Composites for aeropropulsion  
LEWIS-13438 880-10209 04  
Efficient measurement of shear properties of fiber composites  
LEWIS-13011 880-10216 06  
Resistance welding graphite-fiber composites  
MSC-18534 880-10264 08  
Plastic welder  
LANGLEY-12540 880-10274 08  
Resin char oxidation retardant for composites  
LEWIS-13275 880-10354 04  
Composites with nearly zero thermal expansion  
MSC-18724 880-10355 04

High char yield epoxy curing agents  
LEWIS-13226 880-10361 04  
Testing panels in tension and flexure  
M-FS-25421 880-10380 06  
Contour-measuring tool for composite layups  
ARC-11246 880-10417 08  
Hot forming graphite/polyimide structures  
LANGLEY-12547 880-10422 08  
Cutting holes in fabric-faced panels  
MSC-18786 880-10427 08

**COMPRESSED AIR**

Pneumatic-power supply  
MSC-18855 880-10527 07

**COMPRESSIBLE FLOW**

Transonic flow over wing/fuselage configurations  
LANGLEY-12702 880-10525 06

**COMPRESSION TESTS**

Environmental testing under load  
LANGLEY-12602 880-10379 06

**COMPRESSORS**

Gas absorption/desorption temperature-differential engine  
NPO-14528 880-10513 06

**COMPUTER COMPONENTS**

Detecting short circuits during assembly  
ARC-11116 880-10007 01

**COMPUTER GRAPHICS**

Real-time film recording from stroke-written CRT's  
LANGLEY-12529 880-10169 02

**COMPUTER PROGRAMMING**

Automated flow-chart system  
GSFC-12514 880-10147 09  
DDL: Digital systems design language  
M-FS-25352 880-10163 01  
Structured FORTRAN preprocessor  
M-FS-23813 880-10289 09  
MBASIC processor  
NPO-14245 880-10290 09

**COMPUTER PROGRAMS**

A universal structured-design diagrammer  
LANGLEY-12548 880-10558 09

**COMPUTERIZED DESIGN**

Aerodynamic preliminary analysis  
LANGLEY-12404 880-10397 06

**COMPUTERIZED SIMULATION**

Equations of motion for coupled n-body systems  
GSFC-12407 880-10083 06  
Models of MOS and SOS devices  
M-FS-25153 880-10141 08  
System time-domain simulation  
MSC-18333 880-10292 09  
Cost-minimized aircraft trajectories  
ARC-11282 880-10396 06  
Calculating linear A, B, C, and D matrices from a nonlinear dynamic engine simulation  
LEWIS-13250 880-10520 06  
CADAT network translator  
M-FS-25055 880-10551 08  
CADAT integrated circuit artwork program  
M-FS-25017 880-10552 08

**CONCENTRATORS**

Offset paraboloidal solar concentrator  
NPO-14846 880-10320 03  
Low-cost concentrating mirrors  
NPO-14962 880-10542 08

**CONDUCTIVE HEAT TRANSFER**

Heat conduction in three dimensions  
MSC-18616 880-10239 06

Powerful copper chloride laser  
NPO-14782 880-10330 03  
Holes help control temperature  
GSFC-12618 880-10373 06

**CONNECTORS**

Automatic connector for structural beams  
M-FS-25134 880-10094 07  
Flared tube attachment fitting  
MSC-18416 880-10240 07  
Automatic connector joins structural columns  
LANGLEY-12578 880-10251 07  
Ball-joint grounding ring  
MSC-18824 880-10405 07  
Interlocking wedge joint is easily assembled  
LANGLEY-12729 880-10526 07

**CONSTRUCTION**

Automatic connector joins structural columns  
LANGLEY-12578 880-10251 07

**CONSTRUCTION MATERIALS**

Versatile modular scaffolds  
GSFC-12606 880-10406 07

**CONTACT RESISTANCE**

Ohmic contact to GaAs semiconductor  
LANGLEY-12466 880-10263 08

**CONTAINERLESS MELTS**

Containerless materials processing in the laboratory  
M-FS-25242 880-10059 04

**CONTAINMENT**

Soft container for explosive nuts  
MSC-18871 880-10532 07

**CONTAMINANTS**

Detecting contaminants by ultraviolet photography  
M-FS-25296 880-10229 06  
Removing freon gas from hydraulic fluid  
MSC-18740 880-10494 04

**CONTAMINATION**

Bulk lifetime indicates surface contamination  
NPO-14966 880-10511 06

**CONTOURS**

Contour-measuring tool for composite layups  
ARC-11246 880-10417 08  
Film coatings for contoured surfaces  
MSC-18784 880-10425 08

**CONTROL**

One-year assessment of a solar space/water heater--Clinton, Mississippi  
M-FS-25539 880-10477 03

**CONTROL EQUIPMENT**

Torque control for electric motors  
MSC-18635 880-10170 02  
Electromechanical slip sensor  
NPO-14654 880-10253 07  
Multiplexed logic controls solar-heating system  
M-FS-25287 880-10318 03  
Speed control for synchronous motors  
MSC-18680 880-10444 01

**CONTROLLERS**

Controller for solar-energy systems  
M-FS-25386 880-10054 03  
Controller and temperature monitor for solar heating  
M-FS-25387 880-10055 03  
Final report on development of a programmable controller  
M-FS-25388 880-10189 03

Toggled signal for prevention of control errors  
 MSC-18779 880-10312 02  
 Temperature controller adapts to fatigue tester  
 LANGLEY-12393 880-10378 06

**CONVECTION**

Recording fluid currents by holography  
 M-FS-25373 880-10222 06

**CONVECTIVE FLOW**

Analysis of a cooled, turbine blade or vane with an insert  
 LEWIS-13293 880-10400 06

**COOLING**

Inhibiting corrosion in solar-heating and cooling systems  
 M-FS-25387 880-10056 03  
 Compact, super heat exchanger  
 LEWIS-12441 880-10081 06  
 Solar-heating and cooling demonstration project  
 M-FS-25443 880-10203 03  
 Cooling/grounding mount for hybrid circuits  
 MSC-18728 880-10302 01  
 Heat pipes cool probe and sandwich panel  
 LANGLEY-12588; LANGLEY-12637 880-10518 06

**COORDINATES**

Crossed-grid charge locator  
 M-FS-25170 880-10010 01

**COPPER CHLORIDES**

Powerful copper chloride laser  
 NPO-14782 880-10330 03

**CORE SAMPLING**

Drilling side holes from a borehole  
 NPO-14465 880-10066 04

**CORES**

Producing gapped-ferrite transformer cores  
 NPO-14715 880-10273 08

**CORROSION PREVENTION**

Silicon nitride passivation of IC's  
 M-FS-25309 880-10279 08

**CORROSION RESISTANCE**

Inhibiting corrosion in solar-heating and cooling systems  
 M-FS-25387 880-10056 03  
 Corrosion-resistant ceramic thermal barrier coating  
 LEWIS-13088 880-10067 04  
 Photonnitride passivating coating for IC's  
 M-FS-25401 880-10260 08  
 Low cost high temperature, duplex coating for superalloys  
 LEWIS-13497 880-10352 04

**COST ANALYSIS**

Cost models and economical packaging of LSI's  
 M-FS-25359 880-10138 08  
 Optimizing costs of VLSI circuits  
 M-FS-25348 880-10281 08  
 Low-cost LANDSAT processing system  
 M-FS-25396 880-10285 09  
 Determining manufacturing cost from product complexity  
 M-FS-25371 880-10439 09

**COST REDUCTION**

Cost-minimized aircraft trajectories  
 ARC-11282 880-10396 06

**COUNTING CIRCUITS**

Multichannel coincidence circuit  
 LANGLEY-12531 880-10005 01  
 Universal odd-modulus frequency divider  
 NPO-13426 880-10006 01

**COUPLINGS**

Self-energized screw coupling  
 M-FS-25340 880-10096 07  
 Flared tube attachment fitting  
 MSC-18416 880-10240 07  
 The 3-D guidance system with proximity sensors  
 NPO-14521 880-10250 07  
 Automatic connector joins structural columns  
 LANGLEY-12578 880-10251 07  
 Heat-shrinkable sleeve aids in insulating universal joints  
 MSC-18685 880-10270 08  
 Ball-joint grounding ring  
 MSC-18824 880-10405 07  
 Two-headed bolt  
 M-FS-19619 880-10410 07  
 Interlocking wedge joint is easily assembled  
 LANGLEY-12729 880-10526 07

**COVERINGS**

Cap protects aircraft nose cone  
 LANGLEY-12367 880-10362 04

**CRACK PROPAGATION**

Modified displacement gage for cryogenic testing  
 LEWIS-13039 880-10077 06  
 Predicting crack propagation  
 MSC-18718; MSC-18721 880-10283 08

**CRACKING (FRACTURING)**

Eliminating underbead fissuring in superalloys  
 M-FS-19460 880-10114 08

**CREEP ANALYSIS**

Plastic deformation of engines and other nonlinear structures  
 M-FS-23814 880-10399 06

**CREEP PROPERTIES**

Multiple-creep-test apparatus  
 GSFC-12561 880-10080 06  
 New pressure-sensitive silicone adhesive  
 LANGLEY-12737 880-10495 04

**CREEP TESTS**

Multiple-creep-test apparatus  
 GSFC-12561 880-10080 06

**CRUCIFORM WINGS**

Solar-powered aircraft  
 LANGLEY-12615 880-10404 07

**CRYOGENIC EQUIPMENT**

LVDT gage for fracture-toughness tests in liquid hydrogen  
 LEWIS-13038 880-10075 06  
 Tension-mode loading for bend specimens in cryogenics  
 LEWIS-13040 880-10076 06  
 Modified displacement gage for cryogenic testing  
 LEWIS-13039 880-10077 06  
 Cryogenic machining of polyurethane foam  
 MSC-18572 880-10123 08  
 Cryogenic-storage-tank support  
 MSC-14848 880-10258 07  
 Fast response cryogen level sensor  
 MSC-18697 880-10374 06  
 Spiral-wound gasket forms low-temperature seal  
 LANGLEY-12315 880-10543 08

**CRYOGENIC FLUID STORAGE**

Lightweight cryogenic vessel  
 NPO-14794 880-10548 08

**CRYOGENIC FLUIDS**

Fiber optic level sensor for cryogenics  
 MSC-18674 880-10375 06

**CRYOSTATS**

Modified displacement gage for cryogenic testing  
 LEWIS-13039 880-10077 06

**CRYSTAL GROWTH**

Reduced gravity favors columnar crystal growth  
 M-FS-25205 880-10366 04

**CRYSTALLIZATION**

Containerless materials processing in the laboratory  
 M-FS-25242 880-10059 04

**CRYSTALS**

Cleaving machine for hard crystals  
 GSFC-12584 880-10401 07

**CURING**

Knife-edge seal for vacuum bagging  
 M-FS-24049 880-10135 08  
 High char yield epoxy curing agents  
 LEWIS-13226 880-10361 04  
 One-step microwave foaming and curing  
 MSC-18707 880-10420 08

**CURRENT REGULATORS**

Limiting current in electron-beam welders  
 M-FS-19503 880-10413 07

**CURVATURE**

Stream tube curvature analysis  
 LANGLEY-11535 880-10235 06  
 NASTRAN modifications for recovering strains and curvatures  
 LEWIS-12592 880-10395 06

**CUSHIONS**

Modified fire-resistant foams for seat cushions  
 MSC-18704 880-10419 08

**CUTTERS**

Precision filament cutter  
 LANGLEY-12564 880-10093 07  
 Tubing cutter for tight spaces  
 MSC-18538 880-10099 07  
 Cutting holes in fabric-faced panels  
 MSC-18786 880-10427 08

**CYANIDES**

A temperature fixed point near 58 C  
 M-FS-25304 880-10204 04

**D****DAMPING**

Rotor transient analysis  
 LEWIS-13230 880-10259 07

**DATA ACQUISITION**

Solar-site test module  
 M-FS-25543 880-10460 03  
 Cardiopulmonary data-acquisition system  
 MSC-18783 880-10499 05  
 Microprocessor-based cardiometer  
 MSC-18775 880-10501 05

**DATA COLLECTION PLATFORMS**

Applications of remote-sensing imagery  
 M-FS-25107 880-10082 06

**DATA COMPRESSION**

Basic cluster compression algorithm  
 NPO-14816 880-10291 09  
 Compressing TV-image data  
 NPO-14823 880-10310 02  
 An image-data-compression algorithm  
 NPO-14496 880-10438 09

**DATA CONVERTERS**

11-Line to 512-line decoder  
 MSC-19751 880-10158 01

**DATA LINKS**

Multipath star switch controller  
NPO-13422 B80-10035 02

**DATA MANAGEMENT**

NASA PERT time II  
LEWIS-13145 B80-10286 09

**DATA PROCESSING**

Selecting optimum algorithms for image processing  
M-FS-25367 B80-10557 09

**DATA PROCESSING EQUIPMENT**

Microprocessor-controlled data synchronizer  
MSC-18535 B80-10031 02  
RAM-Based frame synchronizer  
GSFC-12430 B80-10164 02  
RAM-Based parallel-output controller  
GSFC-12447 B80-10165 02  
Simultaneous disk storage and retrieval  
KSC-11167 B80-10304 02

**DATA REDUCTION**

Low-cost LANDSAT processing system  
M-FS-25396 B80-10285 09  
Image-based information, communication, and retrieval  
NPO-14893 B80-10293 09

**DATA RETRIEVAL**

Software design and documentation language  
NPO-14610 B80-10145 09  
RAM-Based parallel-output controller  
GSFC-12447 B80-10165 02  
Simultaneous disk storage and retrieval  
KSC-11167 B80-10304 02

**DATA SAMPLING**

Aliasing filter for multirate systems  
MSC-18472 B80-10153 01  
Frequency response for multiple-sampling rate systems  
MSC-18473 B80-10173 02

**DATA STORAGE**

Input/output interface module  
MSC-18180 B80-10159 01  
Simultaneous disk storage and retrieval  
KSC-11167 B80-10304 02

**DATA TRANSMISSION**

Efficient telemetry format  
NPO-13679 B80-10142 09  
RAM-Based frame synchronizer  
GSFC-12430 B80-10164 02

**DECARBONATION**

Carbon scrubber  
MSC-16531 B80-10356 04

**DECODERS**

Independent synchronizer for digital decoders  
MSC-16723 B80-10004 01  
11-Line to 512-line decoder  
MSC-19751 B80-10158 01

**DECONTAMINATION**

Removing freon gas from hydraulic fluid  
MSC-18740 B80-10494 04

**DECOUPLING**

Passive wing/store flutter suppression  
LANGLEY-12468 B80-10219 06

**DEFECTS**

Fresnel lenses for ultrasonic inspection  
MSC-18469 B80-10217 06  
Detection of tanker defects with infrared thermography  
LANGLEY-12655 B80-10221 06

**DEFORMATION**

Reshaping tube ends for welding  
MSC-18462 B80-10407 07

**DEFORMETERS**

Biaxial method for in-plane shear testing  
LANGLEY-12680 B80-10512 06

**DELAY**

Improved code-tracking loop  
MSC-18035 B80-10034 02

**DEMODULATORS**

Microprocessor-based detector for PSK commands  
NPO-14440 B80-10036 02

**DENSIFICATION**

'Densified' tiles form stronger bonds  
MSC-18741 B80-10534 08  
Tile densification with TEOS  
MSC-18737 B80-10535 08

**DEPOSITION**

Automatic chemical vapor deposition  
M-FS-25249 B80-10431 08

**DEPTH MEASUREMENT**

Electronic depth micrometer  
KSC-11181 B80-10385 06

**DESTRUCTIVE TESTS**

Bulk lifetime indicates surface contamination  
NPO-14966 B80-10511 06

**DIFFERENCE EQUATIONS**

Systems improved numerical differencing analyzer  
MSC-18597 B80-10148 09

**DIFFUSION**

Systems improved numerical differencing analyzer  
MSC-18597 B80-10148 09  
Diffusion in single-phase binary alloys  
LANGLEY-12665 B80-10498 04

**DIGITAL COMMAND SYSTEMS**

Frequency response for multiple-sampling rate systems  
MSC-18473 B80-10173 02

**DIGITAL DATA**

11-Line to 512-line decoder  
MSC-19751 B80-10158 01  
Real-time image enhancement  
NPO-14281 B80-10311 02

**DIGITAL FILTERS**

Aliasing filter for multirate systems  
MSC-18472 B80-10153 01  
Smoothing the output from a DAC  
FRC-11025 B80-10160 01  
Converting a digital filter to its analog equivalent  
MSC-18587 B80-10313 02

**DIGITAL SYSTEMS**

DDL: Digital systems design language  
M-FS-25352 B80-10163 01

**DIGITAL TO ANALOG CONVERTERS**

Smoothing the output from a DAC  
FRC-11025 B80-10160 01  
Converting a digital filter to its analog equivalent  
MSC-18587 B80-10313 02

**DIMENSIONAL MEASUREMENT**

Electronic depth micrometer  
KSC-11181 B80-10385 06  
Contour-measuring tool for composite layouts  
ARC-11246 B80-10417 08

**DIMENSIONAL STABILITY**

Test fittings for dimensionally critical tubes  
NPO-14399 B80-10252 07

**DIODES**

Semiconductor step-stress testing  
M-FS-25329 B80-10011 01  
JANTX1N2970B zener diode  
M-FS-25260 B80-10012 01

JANTX1N2989B zener diode  
M-FS-25261 B80-10013 01  
JANTX1N3016B zener diode  
M-FS-25262 B80-10014 01  
JANTX1N3031B zener diode  
M-FS-25263 B80-10015 01  
JANTX1N5622 diode  
M-FS-25280 B80-10016 01  
JANTX1N5623 switching diode  
M-FS-25281 B80-10017 01

**DIPLEXERS**

Diplexer for laser-beam heterodyne receiver  
GSFC-12589 B80-10329 03

**DIRECTIONAL ANTENNAS**

Dual-frequency bidirectional antenna  
GSFC-12501 B80-10154 01

**DISCONNECT DEVICES**

Automatic connector joins structural columns  
LANGLEY-12578 B80-10251 07

**DISEASES**

Compliant transducer measures artery profile  
NPO-14899 B80-10369 05

**DISPERSING**

Spraying suspensions uniformly  
M-FS-25139 B80-10409 07

**DISPERSIONS**

Oxide dispersion strengthened superalloy  
LEWIS-13589 B80-10351 04

**DISPLACEMENT MEASUREMENT**

LVDT gage for fracture-toughness tests in liquid hydrogen  
LEWIS-13038 B80-10075 06  
Modified displacement gage for cryogenic testing  
LEWIS-13039 B80-10077 06

**DISPLAY DEVICES**

Monolithic CCD-array readout  
LANGLEY-12376 B80-10307 02  
Rain, fog, and clouds for aircraft simulators  
ARC-11158 B80-10383 06  
Imager displays free fall in stop action  
NPO-14779 B80-10509 06

**DISTANCE MEASURING EQUIPMENT**

Short-range self-pulsed optical radar  
NPO-14901 B80-10459 03

**DISTRIBUTION FUNCTIONS**

An approximation to student's t-distribution  
LANGLEY-12238 B80-10284 09

**DOORS**

Clamshell door system  
MSC-18468 B80-10101 07

**DOPPLER EFFECT**

Instrument remotely measures wind velocities  
NPO-14524 B80-10176 03

**DOPPLER RADAR**

Microcomputer-based doppler systems for weather monitoring  
GSFC-12448 B80-10166 02

**DOSIMETERS**

Miniature personal UV solar dosimeter  
LANGLEY-12469 B80-10321 03

**DRAG**

Predicting propulsion system drag  
LANGLEY-12619 B80-10238 06

**DRAG REDUCTION**

Grooves reduce aircraft drag  
LANGLEY-12599 B80-10215 06

**DRILL BITS**

Abrasive drill for resilient materials  
LEWIS-13411 B80-10402 07

**DRILLING**

- Drilling side holes from a borehole  
NPO-14465 B80-10066 04
- Drill-motor holding fixture  
MSC-18582 B80-10108 07
- Drilling at right angles in blind holes  
M-FS-19535 B80-10403 07
- Sidewall penetrator for oil wells  
NPO-14306 B80-10528 07

**DROP SIZE**

- Automated holographic drop-size analyzer  
B80-10181 03

**DROPS (LIQUIDS)**

- Photographic measurement of droplet density  
M-FS-25326 B80-10182 03
- Drop tower with no aerodynamic drag  
NPO-14845 B80-10549 08

**DUCTS**

- A versatile tunnel acts as a flexible duct  
M-FS-22636 B80-10242 07

**DUST STORMS**

- Predicting and monitoring duststorms  
NPO-14277 B80-10323 03

**DYE LASERS**

- Simultaneous measurement of three atmospheric pollutants  
NPO-14828 B80-10359 04

**DYNAMIC CHARACTERISTICS**

- Frequency response to multiple-sampling rate systems  
MSC-18473 B80-10173 02

**DYNAMIC LOADS**

- Isolation and measurement of rotor vibration forces  
LANGLEY-12476 B80-10507 06

**DYNAMIC RESPONSE**

- Rotor transient analysis  
LEWIS-13230 B80-10259 07
- An all-FORTRAN version of NASTRAN for the VAX  
GSFC-12600 B80-10522 06

**DYNAMIC STABILITY**

- Isolation and measurement of rotor vibration forces  
LANGLEY-12476 B80-10507 06

**E**

**EARTH ATMOSPHERE**

- Ultraviolet spectrometer/polarimeter  
M-FS-25298 B80-10042 03

**ECONOMIC ANALYSIS**

- Optimizing costs of VLSI circuits  
M-FS-25348 B80-10281 08

**ECONOMIC DEVELOPMENT**

- Should we industrialize space?  
M-FS-23963 B80-10137 08

**EDDY CURRENTS**

- Eddy-current sensor measures bolt loading  
M-FS-19486 B80-10079 06

**EDITING ROUTINES (COMPUTERS)**

- A universal structured-design diagrammer  
LANGLEY-12548 B80-10558 09

**EDUCATION**

- Learning high-quality soldering  
NPO-14869 B80-10539 08

**ELASTIC DEFORMATION**

- Plastic deformation of engines and other nonlinear structures  
M-FS-23814 B80-10399 06

**ELASTIC PROPERTIES**

- Composites with nearly zero thermal expansion  
MSC-18724 B80-10355 04

**ELASTOMERS**

- Film coatings for contoured surfaces  
MSC-18784 B80-10425 08

**ELECTRIC CONDUCTORS**

- NASA charging analyzer program  
LEWIS-12973 B80-10058 03
- Electrically conductive palladium-containing polyimide films  
LANGLEY-12629 B80-10357 04

**ELECTRIC CONNECTORS**

- Connector heat shield  
MSC-16282 B80-10126 08
- Kilovolt vacuum feed through is less noisy  
NPO-14802 B80-10426 08

**ELECTRIC CONTACTS**

- Back contacts for silicon-on-ceramic solar cells  
NPO-14809 B80-10545 08

**ELECTRIC CONTROL**

- Torque control for electric motors  
MSC-18635 B80-10170 02

**ELECTRIC DISCHARGES**

- Pulse-shaping circuit for laser excitation  
NPO-14556 B80-10453 03

**ELECTRIC GENERATORS**

- A linear magnetic motor and generator  
GSFC-12518 B80-10257 07

**ELECTRIC MOTORS**

- Improved power factor controller  
M-FS-25323 B80-10149 01
- Torque control for electric motors  
MSC-18635 B80-10170 02
- A linear magnetic motor and generator  
GSFC-12518 B80-10257 07

**ELECTRIC WIRE**

- Wire harness twisting aid  
MSC-18581 B80-10132 08

**ELECTRICAL FAULTS**

- Coatings for hybrid microcircuits  
M-FS-25292 B80-10116 08
- Model for MOS field-time-dependent breakdown  
NPO-14701 B80-10162 01

**ELECTRICAL GROUNDING**

- Simple circuit monitors 'third wire' in ac lines  
M-FS-19457 B80-10002 01
- Cooling/grounding mount for hybrid circuits  
MSC-18728 B80-10302 01
- Ball-joint grounding ring  
MSC-18824 B80-10405 07

**ELECTRICAL MEASUREMENT**

- Low-resistance continuity tester  
NPO-14881 B80-10445 01

**ELECTRICAL RESISTANCE**

- Low-resistance continuity tester  
NPO-14881 B80-10445 01

**ELECTRICAL RESISTIVITY**

- Electrically conductive palladium-containing polyimide films  
LANGLEY-12629 B80-10357 04

**ELECTROACOUSTIC TRANSDUCERS**

- Broadband electrostatic acoustic transducer for liquids  
LANGLEY-12465 B80-10078 06

**ELECTROCARDIOGRAPHY**

- Testing EKG electrodes on-line  
MSC-18696 B80-10212 05
- Microprocessor-based cardiometer  
MSC-18775 B80-10501 05

**ELECTROCATALYSTS**

- REDOX electrochemical energy storage  
LEWIS-13398 B80-10064 04
- Improved cell for water-vapor electrolysis  
MSC-16394 B80-10489 04

**ELECTROCHEMICAL CELLS**

- REDOX electrochemical energy storage  
LEWIS-13398 B80-10064 04

**ELECTRODES**

- Testing EKG electrodes on-line  
MSC-18696 B80-10212 05
- Honing fixture for welded electrodes  
M-FS-19537 B80-10278 08
- Limiting current in electron-beam welders  
M-FS-19503 B80-10413 07

**ELECTROLYTES**

- Photoelectrochemical cell with nondissolving anode  
LANGLEY-12591 B80-10038 03

**ELECTROLYTIC CELLS**

- Improved cell for water-vapor electrolysis  
MSC-16394 B80-10489 04

**ELECTROMAGNETIC INTERFERENCE**

- Improved battery charger for electric vehicles  
NPO-14964 B80-10440 01

**ELECTROMAGNETIC WAVE FILTERS**

- Smoothing the output from a DAC  
FRC-11025 B80-10160 01

**ELECTROMECHANICAL DEVICES**

- Improved battery charger for electric vehicles  
NPO-14964 B80-10440 01

**ELECTRON AVALANCHE**

- Measuring radiation effects on MOS capacitors  
NPO-14700 B80-10227 06

**ELECTRON BEAM WELDING**

- Verifying root fusion in electron-beam welds  
M-FS-19499 B80-10110 08
- X-ray technique verifies weld-root fusion  
M-FS-19468 B80-10111 08
- Electron-beam welder circle generator  
M-FS-19441 B80-10275 08
- 'Foreign material' to verify root fusion in welded joints  
M-FS-19496 B80-10276 08
- Limiting current in electron-beam welders  
M-FS-19503 B80-10413 07

**ELECTRON BEAMS**

- Superconducting gyrocon would be very efficient  
NPO-14975 B80-10446 02
- Improved LEEM ranges over four decades  
LANGLEY-12706 B80-10508 06

**ELECTRON DISTRIBUTION**

- Crossed-grid charge locator  
M-FS-25170 B80-10010 01

**ELECTRON MICROSCOPES**

- Vise holds specimens for microscope  
MSC-18690 B80-10098 07

**ELECTRON RADIATION**

- Applying the helium ionization detector in chromatography  
MSC-18835 B80-10490 04

**ELECTRON TRAJECTORIES**

- Numerical tracing of electron trajectories  
GSFC-12535 B80-10057 03

**ELECTRON TUBES**

Superconducting gyrocon would be very efficient  
NPO-14975 880-10446 02

**ELECTRONIC CONTROL**

Speed control for synchronous motors  
MSC-18680 880-10444 01

**ELECTRONIC EQUIPMENT**

Signal conditioner for nickel temperature sensors  
MSC-18367 880-10298 01

**ELECTRONIC EQUIPMENT TESTS**

Testing EKG electrodes on-line  
MSC-18696 880-10212 05

**ELECTRONIC PACKAGING**

Placement technique for semicustom digital LSI circuits  
M-FS-25324 880-10117 08  
Double metalization for VLSI  
M-FS-25149 880-10261 08  
Cooling/grounding mount for hybrid circuits  
MSC-18728 880-10302 01  
Lightweight terminal board  
MSC-18787 880-10429 08  
Transistor package for high pressure applications  
MSC-18743 880-10430 08  
CADAT logic simulation program  
M-F-25183 880-10432 08  
CADAT test pattern generator  
M-FS-25066 880-10433 08  
CADAT field-effect-transistor simulator  
M-FS-25067 880-10434 08  
CADAT place-and-routine in two dimensions  
M-FS-25058 880-10435 08  
CADAT multiport placement and routing  
M-FS-25065 880-10436 08  
CADAT integrated circuit mask analysis  
M-FS-25054 880-10437 08

**ELECTRONIC TRANSDUCERS**

Ultrasonic frequency analysis  
LANGLEY-12697 880-10377 06

**ELECTROPLATING**

Selective optical coatings for solar collectors  
M-FS-23589 880-10192 03

**ELECTROSTATIC CHARGE**

Reducing static charges in fluidized bed reactions  
ARC-11245 880-10068 04

**ELLIPTICAL POLARIZATION**

Multiband microstrip antenna  
MSC-18334 880-10001 01

**ELONGATION**

Gentle arrester for moving bodies  
LANGLEY-12372 880-10531 07

**EMITTANCE**

User chooses coating properties  
LANGLEY-12719 880-10493 04

**ENDOSCOPES**

Fiber-optics couple arthroscope to TV  
LANGLEY-12718 880-10504 05

**ENERGY CONSERVATION**

Energy-saving thermostat  
LANGLEY-12450 880-10040 03  
Energy-reduction concept for incandescent lamps  
MSC-18757 880-10325 03

**ENERGY CONVERSION**

Extracting energy from natural flow  
M-FS-23989 880-10045 03  
Solar cell is housed in light-bulb enclosure  
LEWIS-13418 880-10442 01

Gas absorption/desorption temperature-differential engine  
NPO-14528 880-10513 06

**ENERGY CONVERSION EFFICIENCY**

New mounting improves solar-cell efficiency  
NPO-14467 880-10039 03  
Improved power factor controller  
M-FS-25323 880-10149 01  
Energy saving in ac generators  
M-FS-25302 880-10150 01  
Combined photovoltaic and thermal-storage module  
NPO-14591 880-10327 03

**ENERGY DISSIPATION**

A redundant regulator control with low standby losses  
NPO-13165 880-10172 02

**ENERGY DISTRIBUTION**

Far-field radiation pattern of tunable diode lasers  
LANGLEY-12631 880-10177 03

**ENERGY POLICY**

Coal conversion and synthetic-fuel production  
M-FS-25330 880-10070 04  
Underground Coal Mining  
NPO-14704 880-10071 04

**ENERGY STORAGE**

REDOX electrochemical energy storage  
LEWIS-13398 880-10064 04  
Self-energized screw coupling  
M-FS-25340 880-10096 07

**ENERGY TECHNOLOGY**

A survey of photovoltaic systems  
M-FS-25397 880-10187 03  
A test program for solar collectors  
M-FS-25433 880-10194 03  
Operational tests of a solar energy system Florida site  
M-FS-25423 880-10196 03  
A solar-energy system in Pennsylvania  
M-FS-25427 880-10197 03  
Installation guidelines for the Pennsylvania system  
M-FS-25424 880-10198 03  
A solar-energy system in Minnesota  
M-FS-25428 880-10199 03  
Solar-energy system evaluation-Pennsylvania site  
M-FS-25434 880-10200 03  
A hot-water system tested onsite--Togus, Maine  
M-FS-25435 880-10201 03  
A reliable solar-heating system--Huntsville, Alabama  
M-FS-25431 880-10202 03  
Solar-heating and cooling demonstration project  
M-FS-25443 880-10203 03

**ENGINE COOLANTS**

Full-coverage film cooling  
LEWIS-13249 880-10091 06

**ENGINE DESIGN**

Viscous characteristics analysis  
LANGLEY-12598 880-10084 06  
Plastic deformation of engines and other nonlinear structures  
M-FS-23814 880-10399 06  
Gas absorption/desorption temperature-differential engine  
NPO-14528 880-10513 06  
Calculating linear A, B, C, and D matrices from a nonlinear dynamic engine simulation  
LEWIS-13250 880-10520 06

**ENGINES**

Additive improves engine-oil performance  
GSFC-12327 880-10065 04

**ENVIRONMENT EFFECTS**

Environmental testing under load  
LANGLEY-12602 880-10379 06

**ENVIRONMENT POLLUTION**

Recycling paper-pulp waste liquors  
NPO-14797 880-10492 04

**ENVIRONMENT SIMULATORS**

Environmental testing under load  
LANGLEY-12602 880-10379 06

**ENVIRONMENTAL CONTROL**

Data-acquisition and control system for severe environments  
M-FS-25471 880-10333 03

**ENVIRONMENTAL TESTS**

A test program for solar collectors  
M-FS-25433 880-10194 03  
Environmental testing under load  
LANGLEY-12602 880-10379 06

**ENZYMES**

Hybrid polymer microspheres  
NPO-14462 880-10208 04

**EPOXY RESINS**

Examining graphite reinforcement in composites  
MSC-19594 880-10122 08  
High char yield epoxy curing agents  
LEWIS-13226 880-10361 04  
Quick mixing of epoxy components  
MSC-18731 880-10415 07

**EQUATIONS OF MOTION**

Equations of motion for coupled n-body systems  
GSFC-12407 880-10083 06

**EQUATIONS OF STATE**

An equation of state for liquids  
NPO-14821 880-10174 03

**EQUILIBRIUM FLOW**

Analysis of a cooled, turbine blade or vane with an insert  
LEWIS-13293 880-10400 06

**ERROR CORRECTING CODES**

Improved code-tracking loop  
MSC-18035 880-10034 02

**ESTIMATING**

Estimation of incomplete multinomial data  
LANGLEY-12593 880-10146 09

**ETCHANTS**

Etchant for incoloy-903 welds  
M-FS-19378 880-10112 08

**ETCHING**

Ion-beam etching enhances adhesive bonding  
LEWIS-13028 880-10128 08

**ETHYLENE COMPOUNDS**

A temperature fixed point near 58 C  
M-FS-25304 880-10204 04

**EXPANDABLE STRUCTURES**

A versatile tunnel acts as a flexible duct  
M-FS-22636 880-10242 07

**EXPLOSIVES**

Soft container for explosive nuts  
MSC-18871 880-10532 07

**EXPOSURE**

Camera add-on records time of exposure  
LANGLEY-12635 880-10183 03

**EXTENSIONS**

Torque-wrench extension  
MSC-18769 880-10414 07

**EXTENSOMETERS**

Eddy-current sensor measures bolt loading  
 M-FS-19486 B80-10079 06  
 Bolt-tension indicator  
 M-FS-19324 B80-10105 07  
**EXTRACTION**  
 Wrench for smooth or damaged fasteners  
 MSC-18772 B80-10416 07

**F****FABRICATION**

Lightweight terminal board  
 MSC-18787 B80-10429 08

**FABRICS**

Cutting holes in fabric-faced panels  
 MSC-18786 B80-10427 08

**FAILURE MODES**

Tagged signal for prevention of control errors  
 MSC-18779 B80-10312 02

**FALLING SPHERES**

Tracking falling objects  
 NPO-14813 B80-10328 03  
 Drop tower with no aerodynamic drag  
 NPO-14845 B80-10549 08

**FASTENERS**

Self-energized screw coupling  
 M-FS-25340 B80-10096 07  
 Retaining a sleeve on a shaft  
 M-FS-19518 B80-10103 07  
 Flush-mounting technique for composite beams  
 LANGLEY-12389 B80-10121 08  
 Locknut preload tool  
 MSC-16153 B80-10245 07  
 Bayonet plug with ramp-activated lock  
 MSC-18526 B80-10247 07  
 Handtool assists in bundling cables  
 MSC-18567 B80-10255 07  
 Two-headed bolt  
 M-FS-19619 B80-10410 07  
 Interlocking wedge joint is easily assembled  
 LANGLEY-12729 B80-10526 07  
 Eliminating gaps in split rings  
 MSC-18854 B80-10540 08

**FATIGUE (MATERIALS)**

Predicting crack propagation  
 MSC-18718; MSC-18721 B80-10283 08

**FATIGUE TESTING MACHINES**

Temperature controller adapts to fatigue tester  
 LANGLEY-12393 B80-10378 06

**FATIGUE TESTS**

Predicting lifetime of cast parts  
 M-FS-19549 B80-10228 06

**FEEDBACK CONTROL**

Temperature-compensating dc restorer  
 LANGLEY-12549 B80-10152 01  
 Speed control for synchronous motors  
 MSC-18680 B80-10444 01

**FERRITES**

Producing gapped-ferrite transformer cores  
 NPO-14715 B80-10273 08

**FIBER OPTICS**

Improved ureteral stone fragmentation catheter  
 NPO-14745 B80-10370 05  
 Fiber optic level sensor for cryogenics  
 MSC-18674 B80-10375 06

Fiber optic accelerometer  
 LEWIS-13219 B80-10389 06  
 Aligning sleeve for optical fibers  
 MSC-18756 B80-10424 01  
 Fiber-optics couple arthroscope to TV  
 LANGLEY-12718 B80-10504 05

**FIBERS**

Precision filament cutter  
 LANGLEY-12564 B80-10093 07

**FIELD EFFECT TRANSISTORS**

Continuous control of phase-locked-loop bandwidth  
 MSC-16684 B80-10008 01  
 JANTX2N4856 field-effect transistor  
 M-FS-25269 B80-10030 01  
 Progress in MOSFET double-layer metalization  
 M-FS-25239 B80-10280 08  
 CADAT field-effect-transistor simulator  
 M-FS-25067 B80-10434 08

Simple JFET oscillator  
 GSFC-12555 B80-10443 01

**FILLERS**

Repairing high-temperature glazed tiles  
 MSC-18736 B80-10536 08

**FILM COOLING**

Full-coverage film cooling  
 LEWIS-13249 B80-10091 06

**FILMS**

Reflecting layers reduce weight of insulation  
 MSC-18785 B80-10547 08

**FILTRATION**

Improved particulate-sampling filter  
 NPO-14801 B80-10271 08  
 Treating domestic wastewater with water hyacinths  
 M-FS-23964 B80-10368 05

**FINITE ELEMENT METHOD**

Resizing structures for minimum weight  
 LANGLEY-12699 B80-10394 06

**FIRE PREVENTION**

A new family of fire-resistant foams  
 MSC-16921 B80-10418 08  
 Modified fire-resistant foams for seat cushions  
 MSC-18704 B80-10419 08  
 One-step microwave foaming and curing  
 MSC-18707 B80-10420 08  
 Rigid fire-resistant foams for walls and floors  
 MSC-18708 B80-10421 08

**FITTINGS**

Flared tube attachment fitting  
 MSC-18416 B80-10240 07  
 Test fittings for dimensionally critical tubes  
 NPO-14399 B80-10252 07

**FLAME PROPAGATION**

Methane/air flames in a concentric tube combustor  
 LEWIS-13388 B80-10211 04

**FLAME RETARDANTS**

Resin char oxidation retardant for composites  
 LEWIS-13275 B80-10354 04  
 High char yield epoxy curing agents  
 LEWIS-13226 B80-10361 04  
 A new family of fire-resistant foams  
 MSC-16921 B80-10418 08  
 Modified fire-resistant foams for seat cushions  
 MSC-18704 B80-10419 08  
 One-step microwave foaming and curing  
 MSC-18707 B80-10420 08

Rigid fire-resistant foams for walls and floors  
 MSC-18708 B80-10421 08

**FLAMMABILITY**

Fire tests for airplane interior materials  
 MSC-18478 B80-10063 04  
 Safely splicing glass optical fibers  
 KSC-11107 B80-10134 08

**FLANGES**

Compact positioning flange  
 MSC-14876 B80-10104 07

**FLARED BODIES**

Flared tube attachment fitting  
 MSC-18416 B80-10240 07  
 Tube flare inspection tool  
 MSC-19636 B80-10241 07

**FLASHBACK**

Flashback-free combustor  
 LANGLEY-12666 B80-10226 06

**FLEXIBILITY**

Aluminum ions enhance polyimide adhesive  
 LANGLEY-12640 B80-10358 04

**FLEXING**

Testing panels in tension and flexure  
 M-FS-25421 B80-10380 06

**FLICKER**

Real-time film recording from stroke-written CRT's  
 LANGLEY-12529 B80-10169 02

**FLIGHT CONTROL**

Dual mode actuator  
 LANGLEY-12412 B80-10106 07

**FLIGHT HAZARDS**

Fire tests for airplane interior materials  
 MSC-18478 B80-10063 04

**FLIGHT MECHANICS**

Cost-minimized aircraft trajectories  
 ARC-11282 B80-10396 06

**FLIGHT SIMULATORS**

Rain, fog, and clouds for aircraft simulators  
 ARC-11158 B80-10383 06

**FLOW CHARACTERISTICS**

Improved multielement airfoil analysis  
 LANGLEY-12489 B80-10086 06

**FLOW CHARTS**

Automated flow-chart system  
 GSFC-12514 B80-10147 09  
 A universal structured-design diagrammer  
 LANGLEY-12548 B80-10558 09

**FLOW DISTRIBUTION**

Viscous characteristics analysis  
 LANGLEY-12598 B80-10084 06  
 Flow field in supersonic mixed-compression inlets  
 LEWIS-13279 B80-10088 06  
 Stream tube curvature analysis  
 LANGLEY-11535 B80-10235 06  
 A generalized vortex lattice method  
 LANGLEY-12636 B80-10236 06  
 Wakeflow analysis by cost  
 NPO-14705 B80-10387 06

Inviscid transonic flow over axisymmetric bodies  
 LANGLEY-12499 B80-10398 06  
 The design and analysis of low-speed airfoils  
 LANGLEY-12727 B80-10524 06

**FLOW MEASUREMENT**

Fast calibration of gas flowmeters  
 KSC-11076 B80-10516 06

**FLOWMETERS**

Flow sensor for biomedical fluids  
 MSC-18761 B80-10367 05

**FLUID FILTERS**

Improved particulate-sampling filter  
NPO-14801 880-10271 08

**FLUID FLOW**

Grooves reduce aircraft drag  
LANGLEY-12599 880-10215 06  
Recording fluid currents by holography  
M-FS-25373 880-10222 06  
Design considerations for mechanical face seals  
LEWIS-13146 880-10233 06  
Test fittings for dimensionally critical tubes  
NPO-14399 880-10252 07  
Dynamics of cavitating cascades and inducer pumps  
M-FS-25399 880-10392 06  
Reduced viscosity interpreted for fluid/gas mixtures  
NPO-14976 880-10457 03  
Potential flow in two-dimensional deflected nozzles  
LEWIS-13461 880-10523 06  
Transonic flow over wing/fuselage configurations  
LANGLEY-12702 880-10525 06

**FLUID POWER**

Extracting energy from natural flow  
M-FS-23989 880-10045 03

**FLUID TRANSMISSION LINES**

Flared tube attachment fitting  
MSC-18416 880-10240 07

**FLUIDIZED BED PROCESSORS**

Reducing static charges in fluidized bed reactions  
ARC-11245 880-10068 04  
Producing silicon continuously  
NPO-14796 880-10537 08

**FLUORESCENCE**

Fluorescent radiation converter  
GSFC-12528 880-10180 03  
Laser-fluorescence measurement of marine algae  
LANGLEY-12282 880-10213 05  
Simultaneous measurement of three atmospheric pollutants  
NPO-14828 880-10359 04

**FLUOROCARBONS**

Film coatings for contoured surfaces  
MSC-18784 880-10425 08

**FLUTTER**

Extracting energy from natural flow  
M-FS-23989 880-10045 03  
Passive wing/store flutter suppression  
LANGLEY-12468 880-10219 06

**FLUX DENSITY**

Improved magnetic material analyzer  
LEWIS-13493 880-10384 06

**FOAMS**

Cryogenic machining of polyurethane foam  
MSC-18572 880-10123 08  
Foam-filled cushions for sliding trays  
MSC-18565 880-10127 08  
A new family of fire-resistant foams  
MSC-16921 880-10418 08  
Modified fire-resistant foams for seat cushions  
MSC-18704 880-10419 08  
One-step microwave foaming and curing  
MSC-18707 880-10420 08  
Rigid fire-resistant foams for walls and floors  
MSC-18708 880-10421 08

**FOCUSING**

Acoustic lens is gas-filled  
NPO-14757 880-10376 06

**FORMING TECHNIQUES**

Forming complex cavities in clear plastic  
LEWIS-13412 880-10267 08

**FORTRAN**

Automated flow-chart system  
GSFC-12514 880-10147 09  
Structured FORTRAN preprocessor  
M-FS-23813 880-10289 09  
An all-FORTRAN version of NASTRAN for the VAX  
GSFC-12600 880-10522 06

**FORWARD SCATTERING**

Noise suppression in forward-scattering optical instruments  
LANGLEY-12730 880-10324 03

**FRACTURE MECHANICS**

Predicting crack propagation  
MSC-18718; MSC-18721 880-10283 08

**FRACTURE STRENGTH**

LVDT gage for fracture-toughness tests in liquid hydrogen  
LEWIS-13038 880-10075 06  
Tension-mode loading for bend specimens in cryogenics  
LEWIS-13040 880-10076 06  
Modified displacement gage for cryogenic testing  
LEWIS-13039 880-10077 06

**FRAMES**

Versatile modular scaffolds  
GSFC-12606 880-10406 07

**FREE FALL**

Tracking falling objects  
NPO-14813 880-10328 03  
Imager displays free fall in stop action  
NPO-14779 880-10509 06  
Drop tower with no aerodynamic drag  
NPO-14845 880-10549 08

**FREE FLOW**

Extracting energy from natural flow  
M-FS-23989 880-10045 03

**FREON**

Removing freon gas from hydraulic fluid  
MSC-18740 880-10494 04

**FREQUENCIES**

Vibration modes and frequencies of structures  
LANGLEY-12647 880-10237 06

**FREQUENCY ANALYZERS**

Frequency response for multiple-sampling rate systems  
MSC-18473 880-10173 02  
Ultrasonic frequency analysis  
LANGLEY-12697 880-10377 06

**FREQUENCY CONTROL**

Frequency-controlled voltage regulator  
NPO-13633 880-10171 02

**FREQUENCY CONVERTERS**

Frequency-controlled voltage regulator  
NPO-13633 880-10171 02  
Fluorescent radiation converter  
GSFC-12528 880-10180 03

**FREQUENCY DIVIDERS**

Universal odd-modulus frequency divider  
NPO-13426 880-10006 01

**FREQUENCY MEASUREMENT**

Optical calibrator for TDL spectrometers  
GSFC-12562 880-10178 03

**FREQUENCY MODULATION**

Ultrastable automatic frequency control  
MSC-18679 880-10294 01

**FREQUENCY MULTIPLIERS**

Superconducting gyrotron would be very efficient  
NPO-14975 880-10446 02

**FREQUENCY STABILITY**

Ultrastable automatic frequency control  
MSC-18679 880-10294 01

**FREQUENCY STANDARDS**

Integral storage-bulb and microwave cavity for masers  
GSFC-12542 880-10186 03

**FRESNEL DIFFRACTION**

Fresnel lens tracking solar collector  
M-FS-25419 880-10190 03  
Fresnel lenses for ultrasonic inspection  
MSC-18469 880-10217 06

**FRICTION REDUCTION**

Lubrication handbook  
M-FS-25158 880-10210 04

**FUEL INJECTION**

Flashback-free combustor  
LANGLEY-12666 880-10226 06

**FUEL TESTS**

Flashback-free combustor  
LANGLEY-12666 880-10226 06

**FURNACES**

Controlling the shape of glass microballoons  
M-FS-25230 880-10266 08

**FUSION (MELTING)**

Safely splicing glass optical fibers  
KSC-11107 880-10134 08

**FUSION WELDING**

'Foreign material' to verify root fusion in welded joints  
M-FS-19496 880-10276 08

**G****GALLIUM ARSENIDES**

'Pelled-film' solar cells  
NPO-14734 880-10151 01  
Ohmic contact to GaAs semiconductor  
LANGLEY-12466 880-10263 08

**GAPS**

Producing gapped-ferrite transformer cores  
NPO-14715 880-10273 08

**GAS CHROMATOGRAPHY**

Applying the helium ionization detector in chromatography  
MSC-18835 880-10490 04

**GAS COOLING**

Compact, super heat exchanger  
LEWIS-12441 880-10081 06

**GAS DETECTORS**

Laser beam methane detector  
NPO-14929 880-10363 04  
Applying the helium ionization detector in chromatography  
MSC-18835 880-10490 04

**GAS DYNAMICS**

Methane/air flames in a concentric tube combustor  
LEWIS-13388 880-10211 04

**GAS FLOW**

Fast calibration of gas flowmeters  
KSC-11076 880-10516 06

**GAS HEATING**

Benefit assessment of solar-augmented natural gas systems  
NPO-14568 880-10048 03



**GAS LASERS**

- Powerful copper chloride laser  
NPO-14782 B80-10330 03  
Gas-laser power monitor  
LANGLEY-12682 B80-10455 03

**GAS PRESSURE**

- Downhole pressure sensor  
NPO-14729 B80-10223 06

**GAS TURBINE ENGINES**

- Corrosion-resistant ceramic thermal barrier coating  
LEWIS-13088 B80-10067 04  
Full-coverage film cooling  
LEWIS-13249 B80-10091 06  
Oxide dispersion strengthened superalloy  
LEWIS-13589 B80-10351 04  
Gas absorption/desorption temperature-differential engine  
NPO-14528 B80-10513 06

**GAS-LIQUID INTERACTIONS**

- Driving bubbles out of glass  
M-FS-25414 B80-10496 04

**GASEOUS DIFFUSION**

- An automated oxide and diffusion facility for IC's  
M-FS-25357 B80-10282 08

**GASKETS**

- Spiral-wound gasket forms  
low-temperature seal  
LANGLEY-12315 B80-10543 08

**GEARS**

- Self-lubricating gearset  
MSC-18801 B80-10546 08

**GEOLOGICAL SURVEYS**

- Refraction corrections for surveying  
MSC-18664 B80-10231 06

**GEOMAGNETISM**

- Improved LEEM ranges over four decades  
LANGLEY-12706 B80-10508 06

**GIMBALS**

- Compact positioning flange  
MSC-14876 B80-10104 07

**GLASS**

- Controlling the shape of glass microballoons  
M-FS-25230 B80-10266 08  
Driving bubbles out of glass  
M-FS-25414 B80-10496 04  
Arc spraying solderable tabs to glass  
NPO-14853 B80-10544 08

**GLASS FIBERS**

- Safely splicing glass optical fibers  
KSC-11107 B80-10134 08

**GLAZES**

- Mobile glazing unit  
KSC-11171 B80-10538 08

**GLOW DISCHARGES**

- Reducing static charges in fluidized bed reactions  
ARC-11245 B80-10068 04

**GLYCOLS**

- Glycol/water evacuated-tube solar collector  
M-FS-25337 B80-10052 03

**GOLD COATINGS**

- Reflecting layers reduce weight of insulation  
MSC-18785 B80-10547 08

**GONIOMETERS**

- Gage for evaluating rheumatoid hands  
GSFC-12610 B80-10503 05

**GRAVITATION**

- Containerless materials processing in the laboratory  
M-FS-25242 B80-10059 04

**GRINDING (MATERIAL REMOVAL)**

- 'Grinding' cavities in polyurethane foam  
MSC-18564 B80-10124 08

**GROOVING**

- Grooves reduce aircraft drag  
LANGLEY-12599 B80-10215 06

**GROUND SUPPORT EQUIPMENT**

- Developing experiment instrument packages  
GSFC-12536 B80-10451 02

**GUIDANCE SENSORS**

- The 3-D guidance system with proximity sensors  
NPO-14521 B80-10250 07

**GUNN DIODES**

- High-power solid-state microwave transmitter  
NPO-14803 B80-10296 01

**H****HALOGENS**

- Photoproduction of halogens using platinized TiO<sub>2</sub>  
LANGLEY-12713 B80-10491 04

**HAMMERS**

- Aluminum-encased lead mallet  
MSC-18529 B80-10100 07

**HAND (ANATOMY)**

- Gage for evaluating rheumatoid hands  
GSFC-12610 B80-10503 05

**HARNESSES**

- Wire harness twisting aid  
MSC-18581 B80-10132 08

**HEART RATE**

- Microprocessor-based cardiometer  
MSC-18775 B80-10501 05

**HEAT BALANCE**

- Heat-pipe sensor for remote leveling  
GSFC-12095 B80-10248 07

**HEAT EXCHANGERS**

- Thermosyphon heat exchanger  
M-FS-25389 B80-10053 03  
Compact, super heat exchanger  
LEWIS-12441 B80-10081 06  
Alumina barrier for vacuum brazing  
MSC-18528 B80-10125 08  
Operational tests of a solar-energy system in Georgia  
M-FS-25420 B80-10195 03

**HEAT PIPES**

- Heat-pipe sensor for remote leveling  
GSFC-12095 B80-10248 07  
Heat pipes cool probe and sandwich panel  
LANGLEY-12588; LANGLEY-12637 B80-10518 06

**HEAT RESISTANT ALLOYS**

- Eliminating underbead fissuring in superalloys  
M-FS-19460 B80-10114 08  
Oxide dispersion strengthened superalloy  
LEWIS-13589 B80-10351 04  
Low cost high temperature, duplex coating for superalloys  
LEWIS-13497 B80-10352 04

**HEAT SHIELDING**

- Connector heat shield  
MSC-16282 B80-10126 08  
Thermal barrier and gas seal  
MSC-18390 B80-10269 08  
Heat/pressure seal for moving parts  
MSC-18422 B80-10390 06

Tile densification with TEOS

- MSC-18737 B80-10535 08  
Repairing high-temperature glazed tiles  
MSC-18736 B80-10536 08

**HEAT STORAGE**

- Thermal stratification in liquid storage tanks  
M-FS-25416 B80-10188 03  
Combined photovoltaic and thermal-storage module  
NPO-14591 B80-10327 03

**HEAT TRANSFER**

- Automatic thermal switches  
GSFC-12553 B80-10214 06  
Heat conduction in three dimensions  
MSC-18616 B80-10239 06  
Cooling/grounding mount for hybrid circuits  
MSC-18728 B80-10302 01  
Holes help control temperature  
GSFC-12618 B80-10373 06  
Heat switch has no moving parts  
GSFC-12625 B80-10391 06  
Simplified thermal analyzer  
GSFC-12638 B80-10393 06  
Heat pipes cool probe and sandwich panel  
LANGLEY-12588; LANGLEY-12637 B80-10518 06

**HEAT TREATMENT**

- Mobile glazing unit  
KSC-11171 B80-10538 08

**HEATING**

- Computer-controlled warmup circuit  
NPO-14815 B80-10155 01

**HEATING EQUIPMENT**

- Energy-saving thermostat  
LANGLEY-12450 B80-10040 03  
An adjustable solar concentrator  
NPO-14710 B80-10043 03  
Twelve solar-heating/cooling systems: Design and development  
M-FS-25358 B80-10046 03  
Solar-heating and cooling system design package  
M-FS-25393 B80-10047 03  
Benefit assessment of solar-augmented natural gas systems  
NPO-14568 B80-10048 03  
Air-cooled solar-collector specification  
M-FS-25336 B80-10049 03  
Indoor tests of the concentric-tube solar collector  
M-FS-25390 B80-10050 03  
Evacuated-tube solar collector--performance evaluation  
M-FS-25339 B80-10051 03  
Glycol/water evacuated-tube solar collector  
M-FS-25337 B80-10052 03  
Thermosyphon heat exchanger  
M-FS-25389 B80-10053 03  
Controller for solar-energy systems  
M-FS-25386 B80-10054 03  
Controller and temperature monitor for solar heating  
M-FS-25387 B80-10055 03  
Inhibiting corrosion in solar-heating and cooling systems  
M-FS-25387 B80-10056 03  
Easily-assembled helical heater  
LANGLEY-11712 B80-10130 08  
Final report on development of a programmable controller  
M-FS-25388 B80-10189 03  
Fresnel lens tracking solar collector  
M-FS-25419 B80-10190 03

- Outdoor tests of the concentric-tube collector  
M-FS-25398 B80-10191 03
- Selective optical coatings for solar collectors  
M-FS-23589 B80-10192 03
- Finned-absorber solar collector  
M-FS-25385 B80-10193 03
- A test program for solar collectors  
M-FS-25433 B80-10194 03
- Operational tests of a solar-energy system in Georgia  
M-FS-25420 B80-10195 03
- Operational tests of a solar energy system Florida site  
M-FS-25423 B80-10196 03
- A solar-energy system in Pennsylvania  
M-FS-25427 B80-10197 03
- Installation guidelines for the Pennsylvania system  
M-FS-25424 B80-10198 03
- A solar-energy system in Minnesota  
M-FS-25428 B80-10199 03
- Solar-energy system evaluation-Pennsylvania site  
M-FS-25434 B80-10200 03
- A hot-water system tested onsite--Togus, Maine  
M-FS-25435 B80-10201 03
- A reliable solar-heating system--Huntsville, Alabama  
M-FS-25431 B80-10202 03
- Solar-heating and cooling demonstration project  
M-FS-25443 B80-10203 03
- Multiplexed logic controls solar-heating system  
M-FS-25287 B80-10318 03
- Offset paraboloidal solar concentrator  
NPO-14846 B80-10320 03
- Heat for film processing from solar energy  
M-FS-25444 B80-10331 03
- Solar heater/cooler for mass market  
M-FS-25452 B80-10332 03
- Data-acquisition and control system for severe environments  
M-FS-25471 B80-10333 03
- Solar heater/cooler for mass market  
M-FS-25468 B80-10334 03
- Solar--heated and cooled office building--Dalton, Georgia  
M-FS-25451 B80-10335 03
- Solar-heating and hot water system--St. Louis, Missouri  
M-FS-25453 B80-10336 03
- Solar heating for an electronics manufacturing plant--Blue Earth, Minnesota  
M-FS-25469 B80-10337 03
- Costs and description of a solar-energy system--Austin, Texas  
M-FS-25472 B80-10338 03
- Solar energy in a historical city--Abbreville, South Carolina  
M-FS-25479 B80-10339 03
- municipal recreation center is heated and cooled by solar energy  
M-FS-25478 B80-10340 03
- Solar energy meets 50 percent of motel hot water needs--Key West, Florida  
M-FS-25454 B80-10341 03
- Solar heated office complex--Greenwood, South Carolina  
M-FS-25458 B80-10342 03
- Residential system tested in an office--Huntsville, Alabama  
M-FS-25481 B80-10343 03
- Solar heated two level residence--Akron, Ohio  
M-FS-25480 B80-10344 03
- Solar energy workshop--Tucson, Arizona  
M-FS-25473 B80-10345 03
- Residential solar hot water system--Tempe, Arizona  
M-FS-25490 B80-10346 03
- Residential solar heating installation--Stillwater, Minnesota  
M-FS-25504 B80-10347 03
- Three story residence with solar heat--Manchester, New Hampshire  
M-FS-25499 B80-10348 03
- A high school is supplied with solar energy--Dallas, Texas  
M-FS-25514 B80-10349 03
- Evaluation of an evacuated-tube liquid solar collector  
M-FS-25450 B80-10461 03
- Solar water heater design package  
M-FS-25521 B80-10462 03
- Five-city economics of a solar hot-water-system  
M-FS-25532 B80-10463 03
- Economic evaluation of a solar hot-water-system  
M-FS-25529 B80-10464 03
- Residential solar-heating system uses pyramidal optics  
M-FS-25567 B80-10465 03
- Solar-heated bank-Marks Mississippi  
M-FS-25558 B80-10466 03
- Solar water-heating performance evaluation--San Diego, California  
M-FS-25502 B80-10467 03
- Solar-heated and cooled savings and loan building--1-Leavenworth, Kansas  
M-FS-25520 B80-10468 03
- Solar-energy landmark Building-Columbia, Missouri  
M-FS-25524 B80-10469 03
- Solar heating for an observatory--Lincoln, Nebraska  
M-FS-25525 B80-10470 03
- Two-story residence with solar heating--Newman, Georgia  
M-FS-25526 B80-10471 03
- Solar-energy heats a transportation test center--Pueblo, Colorado  
M-FS-25527 B80-10472 03
- Single-family-residence solar heating--Carlsbad, New Mexico  
M-FS-25528 B80-10473 03
- Multimode solar-heating system--Columbia, South Carolina  
M-FS-25552 B80-10474 03
- Solar-heated swimming school--Wilmington, Delaware  
M-FS-25548 B80-10475 03
- Winter performance of a domestic solar-heating system--Duffield, Virginia  
M-FS-25540 B80-10476 03
- One-year assessment of a solar space/water heater--Clinton, Mississippi  
M-FS-25539 B80-10477 03
- Fire-station solar-energy system--Kansas City, Missouri  
M-FS-25538 B80-10478 03
- Solar-heated ranger station--Glendo, Wyoming  
M-FS-25537 B80-10479 03
- Economic evaluation of a solar hot-water system--Palm Beach County, Florida  
M-FS-25536 B80-10480 03
- Residential system--Lansing, Michigan  
M-FS-25530 B80-10481 03
- Solar space-heating system--Yosemite National Park, California  
M-FS-25553 B80-10482 03
- Motel solar-hot-water system--Dallas, Texas  
M-FS-25575 B80-10483 03
- Motel solar-hot-water system with nonpressurized storage--Jacksonville, Florida  
M-FS-25569 B80-10484 03
- Closed-circulation system for motel hot water--Savannah, Georgia  
M-FS-25572 B80-10485 03
- Solar heating for a restaurant--North Little Rock, Arkansas  
M-FS-25568 B80-10486 03
- Motel solar hot-water installation--Atlanta, Georgia  
M-FS-25564 B80-10487 03
- Building with integral solar-heat storage--Starkville, Mississippi  
M-FS-25559 B80-10488 03
- Less-toxic corrosion inhibitors  
M-FS-25496 B80-10497 04
- HELICAL WINDINGS**  
Easily-assembled helical heater  
LANGLEY-11712 B80-10130 08
- HELICOPTER DESIGN**  
Isolation and measurement of rotor vibration forces  
LANGLEY-12476 B80-10507 06
- HELIUM**  
Applying the helium ionization detector in chromatography  
MSC-18835 B80-10490 04
- HERMETIC SEALS**  
Sealing micropores in thin castings  
MSC-18623 B80-10428 08
- HIGH PRESSURE**  
Transistor package for high pressure applications  
MSC-18743 B80-10430 08
- Transducer for extreme temperatures and pressures  
MSC-18778 B80-10510 06
- HIGH RESOLUTION**  
High-resolution ferometer  
NPO-14448 B80-10175 03
- HIGH TEMPERATURE**  
Low cost high temperature, duplex coating for superalloys  
LEWIS-13497 B80-10352 04
- HIGH TEMPERATURE ENVIRONMENTS**  
Transducer for extreme temperatures and pressures  
MSC-18778 B80-10510 06
- HIGH TEMPERATURE GASES**  
Reduced hydrogen permeability at high temperatures  
LEWIS-13485 B80-10364 04
- HIGH VOLTAGES**  
Direct-current converter for gas-discharge lamps  
MSC-18407 B80-10156 01
- Kilovolt vacuum feed through is less noisy  
NPO-14802 B80-10426 08
- HOLDERS**  
Vise holds specimens for microscope  
MSC-18690 B80-10098 07

- Drill-motor holding fixture  
MSC-18582 880-10108 07
- HOLOGRAPHY**  
Automated holographic drop-size analyzer 880-10181 03  
Recording fluid currents by holography  
M-FS-25373 880-10222 06
- HONING**  
Honing fixture for welded electrodes  
M-FS-19537 880-10278 08
- HORN ANTENNAS**  
Dual-frequency bidirectional antenna  
GSFC-12501 880-10154 01
- HOT WORKING**  
Hot forming graphite/polyimide structures  
LANGLEY-12547 880-10422 08
- HYBRID CIRCUITS**  
Cooling/grounding mount for hybrid circuits  
MSC-18728 880-10302 01
- HYDRAULIC EQUIPMENT**  
Locknut preload tool  
MSC-16153 880-10245 07  
Lock for hydraulic actuators  
MSC-18853 880-10530 07
- HYDRAULIC FLUIDS**  
Removing freon gas from hydraulic fluid  
MSC-18740 880-10494 04
- HYDROCARBONS**  
Removing freon gas from hydraulic fluid  
MSC-18740 880-10494 04
- HYDRODYNAMICS**  
Methane/air flames in a concentric tube combustor  
LEWIS-13388 880-10211 04
- HYDROFLUORIC ACID**  
Chemical-milling solution for invar alloy  
M-FS-25365 880-10113 08
- HYDROGEN**  
Removal of hydrogen bubbles from nuclear reactors  
LANGLEY-12597 880-10205 04  
Reduced hydrogen permeability at high temperatures  
LEWIS-13485 880-10364 04
- HYPERTHERMIA**  
Temperature controller for hyperthermia devices  
LANGLEY-12528 880-10072 05
- IMAGE CONVERTERS**  
Photocapacitive image converter  
LANGLEY-12513 880-10009 01  
Four-quadrant CCD analog multiplier  
LANGLEY-12332 880-10305 02  
Monolithic four-quadrant multiplier  
LANGLEY-12330A 880-10306 02  
Monolithic CCD-array readout  
LANGLEY-12376 880-10307 02  
An image-data-compression algorithm  
NPO-14496 880-10438 09
- IMAGE ENHANCEMENT**  
Better-quality CCD-array images  
NPO-14426 880-10168 02  
Digital enhancement of X-rays for NDT  
KSC-11118 880-10232 06  
Real-time image enhancement  
NPO-14281 880-10311 02
- OCCULT-ORSER** complete  
conversational user-language translator  
GSFC-12604 880-10556 09
- IMAGERY**  
Applications of remote-sensing imagery  
M-FS-25107 880-10082 06  
Low-cost LANDSAT processing system  
M-FS-25396 880-10285 09  
Image-based information, communication, and retrieval  
NPO-14893 880-10293 09  
Evaluating computer-drawn ground-cover maps  
KSC-11195 880-10555 09  
Selecting optimum algorithms for image processing  
M-FS-25367 880-10557 09
- IMAGING TECHNIQUES**  
Numerical tracing of electron trajectories  
GSFC-12535 880-10057 03  
Acoustically-tuned optical spectrometer  
HQN-10924 880-10326 03  
Imager displays free fall in stop action  
NPO-14779 880-10509 06
- IMPACTORS**  
Aluminum-encased lead mallet  
MSC-18529 880-10100 07
- IMPELLERS**  
Dynamics of cavitating cascades and inducer pumps  
M-FS-25399 880-10392 06
- IMPINGEMENT**  
Analysis of a cooled, turbine blade or vane with an insert  
LEWIS-13293 880-10400 06
- INDUCTION HEATING**  
Plastic welder  
LANGLEY-12540 880-10274 08
- INDUCTION MOTORS**  
Improved power factor controller  
M-FS-25323 880-10149 01
- INDUCTORS**  
Improved magnetic material analyzer  
LEWIS-13493 880-10384 06
- INDUSTRIAL PLANTS**  
Microprocessor systems for industrial process control  
NPO-14661 880-10131 08
- INDUSTRIES**  
Should we industrialize space?  
M-FS-23963 880-10137 08
- INERTIA**  
Interchangeable spring modules for inertia measurements  
LANGLEY-12402 880-10386 06
- INFORMATION RETRIEVAL**  
Photocapacitive image converter  
LANGLEY-12513 880-10009 01
- INFRARED DETECTORS**  
Compact infrared detector  
NPO-14864 880-10515 06
- INFRARED INSPECTION**  
Detection of tanker defects with infrared thermography  
LANGLEY-12655 880-10221 06
- INFRARED RADIATION**  
Fast-response atmospheric-pollutant monitor  
LANGLEY-12317 880-10062 04
- INFRARED REFLECTION**  
Energy-reduction concept for incandescent lamps  
MSC-18757 880-10325 03
- INHIBITORS**  
Additive improves engine-oil performance  
GSFC-12327 880-10065 04  
Silicon nitride passivation of IC's  
M-FS-25309 880-10279 08
- INJECTION LASERS**  
Tunable pulsed carbon dioxide laser  
NPO-14984 880-10458 03
- INSPECTION**  
Detecting contaminants by ultraviolet photography  
M-FS-25296 880-10229 06
- INSTALLATION MANUALS**  
Installation guidelines for the Pennsylvania system  
M-FS-25424 880-10198 03
- INSTALLING**  
Heat-shrinkable sleeve aids in insulating universal joints  
MSC-18685 880-10270 08
- INSTRUMENT ORIENTATION**  
Compact positioning flange  
MSC-14876 880-10104 07  
X-ray beam pointer  
MSC-18590 880-10254 07
- INSTRUMENT PACKAGES**  
Developing experiment instrument packages  
GSFC-12536 880-10451 02
- INSULATION**  
Measuring the thermal conductivity of insulation  
NPO-14871 880-10382 06  
Electronic depth micrometer  
KSC-11181 880-10385 06  
Reflecting layers reduce weight of insulation  
MSC-18785 880-10547 08
- INTEGRAL TRANSFORMATIONS**  
An approximation for inverse Laplace transforms  
MSC-18867 880-10553 09
- INTEGRATED CIRCUITS**  
Coatings for hybrid microcircuits  
M-FS-25292 880-10116 08  
Placement technique for semicustom digital LSI circuits  
M-FS-25324 880-10117 08  
Cost models and economical packaging of LSI's  
M-FS-25359 880-10138 08  
Automated ion implantation for IC's  
M-FS-25193 880-10139 08  
An automated photolithography facility for IC's  
M-FS-25073 880-10140 08  
Models of MOS and SOS devices  
M-FS-25153 880-10141 08  
Photonitride passivating coating for IC's  
M-FS-25401 880-10260 08  
Double metalization for VLSI  
M-FS-25149 880-10261 08  
More-reliable SOS ion implantations  
M-FS-25322 880-10262 08  
Silicon nitride passivation of IC's  
M-FS-25309 880-10279 08  
Progress in MOSFET double-layer metalization  
M-FS-25239 880-10280 08  
Optimizing costs of VLSI circuits  
M-FS-25348 880-10281 08  
An automated oxide and diffusion facility for IC's  
M-FS-25357 880-10282 08

- Cooling/grounding mount for hybrid circuits  
 MSC-18728 880-10302 01  
 Four-quadrant CCD analog multiplier  
 LANGLEY-12332 880-10305 02  
 Monolithic four-quadrant multiplier  
 LANGLEY-12330A 880-10306 02  
 Monolithic CCD-array readout  
 LANGLEY-12376 880-10307 02  
 Automatic chemical vapor deposition  
 M-FS-25249 880-10431 08  
 CADAT logic simulation program  
 M-FS-25183 880-10432 08  
 CADAT test pattern generator  
 M-FS-25066 880-10433 08  
 CADAT field-effect-transistor simulator  
 M-FS-25067 880-10434 08  
 CADAT place-and-routine in two dimensions  
 M-FS-25058 880-10435 08  
 CADAT multiport placement and routing  
 M-FS-25065 880-10436 08  
 CADAT integrated circuit mask analysis  
 M-FS-25054 880-10437 08  
 Low-resistance continuity tester  
 NPO-14881 880-10445 01  
 CADAT network translator  
 M-FS-25055 880-10551 08  
 CADAT integrated circuit artwork program  
 M-FS-25017 880-10552 08
- INTERFACES**  
 Input/output interface module  
 MSC-18180 880-10159 01
- INTERFACIAL TENSION**  
 Driving bubbles out of glass  
 M-FS-25414 880-10496 04
- INTERFEROMETERS**  
 High-resolution spectrometry/interferometer  
 NPO-14448 880-10175 03  
 Diplexer for laser-beam heterodyne receiver  
 GSFC-12589 880-10329 03
- INTERNAL COMBUSTION ENGINES**  
 Additive improves engine-oil performance  
 GSFC-12327 880-10065 04
- INTRAVENOUS PROCEDURES**  
 Flow sensor for biomedical fluids  
 MSC-18761 880-10367 05
- INVERTED CONVERTERS (DC TO AC)**  
 Direct-current converter for gas-discharge lamps  
 MSC-18407 880-10156 01
- INVESTMENT CASTING**  
 Forming complex cavities in clear plastic  
 LEWIS-13412 880-10267 08  
 Sealing micropores in thin castings  
 MSC-18623 880-10428 08
- INVISID FLOW**  
 Viscous characteristics analysis  
 LANGLEY-12598 880-10084 06  
 Stream tube curvature analysis  
 LANGLEY-11535 880-10235 06  
 Inviscid transonic flow over axisymmetric bodies  
 LANGLEY-12499 880-10398 06
- ION BEAMS**  
 Ion-beam cleaning for cold welds  
 LEWIS-12982 880-10115 08  
 Ion-beam etching enhances adhesive bonding  
 LEWIS-13028 880-10128 08
- ION EXCHANGE MEMBRANE ELECTROLYTES**  
 REDOX electrochemical energy storage  
 LEWIS-13398 880-10064 04
- ION EXCHANGING**  
 Hybrid polymer microspheres  
 NPO-14462 880-10208 04
- ION IMPLANTATION**  
 Automated ion implantation for IC's  
 M-FS-25193 880-10139 08  
 More-reliable SOS ion implantations  
 M-FS-25322 880-10262 08
- IONIZATION CHAMBERS**  
 Applying the helium ionization detector in chromatography  
 MSC-18835 880-10490 04
- IRON ALLOYS**  
 Etchant for incoloy-903 welds  
 M-FS-19378 880-10112 08  
 Chemical-milling solution for invar alloy  
 M-FS-25365 880-10113 08
- ISOLATORS**  
 Self-adjusting mechanical snubbing link  
 MSC-16134 880-10246 07
- J**
- JET ENGINES**  
 Suppressing buzz-saw noise in jet engines  
 LANGLEY-12645 880-10220 06
- JIGS**  
 Jig for assembling large composite panels  
 LANGLEY-12394 880-10119 08
- JOINTS (ANATOMY)**  
 Gage for evaluating rheumatoid hands  
 GSFC-12610 880-10503 05
- JOINTS (JUNCTIONS)**  
 Automatic connector for structural beams  
 M-FS-25134 880-10094 07  
 Mechanical end joint for structural columns  
 LANGLEY-12482 880-10095 07  
 Heat-shrinkable sleeve aids in insulating universal joints  
 MSC-18685 880-10270 08  
 Ball-joint grounding ring  
 MSC-18824 880-10405 07  
 Alining sleeve for optical fibers  
 MSC-18756 880-10424 01  
 Interlocking wedge joint is easily assembled  
 LANGLEY-12729 880-10526 07
- JUNCTION TRANSISTORS**  
 Simple JFET oscillator  
 GSFC-12555 880-10443 01
- K**
- KALMAN-SCHMIDT FILTERING**  
 Linear stochastic optimal control and estimation problem  
 LEWIS-13206 880-10287 09
- KLYSTRONS**  
 Computer-controlled warmup circuit  
 NPO-14815 880-10155 01
- L**
- LAMINAR FLOW AIRFOILS**  
 Disturbance amplification rates  
 LANGLEY-12556 880-10092 06
- LAMINATES**  
 Jig for assembling large composite panels  
 LANGLEY-12394 880-10119 08  
 Shaping graphite/epoxy stiffeners  
 MSC-18494 880-10120 08  
 Plasticizer for polyimide composites  
 LANGLEY-12642 880-10206 04  
 Cutting holes in fabric-faced panels  
 MSC-18786 880-10427 08
- LAND USE**  
 Applications of remote-sensing imagery  
 M-FS-25107 880-10082 06
- LANDSAT SATELLITES**  
 Applications of remote-sensing imagery  
 M-FS-25107 880-10082 06  
 Low-cost LANDSAT processing system  
 M-FS-25396 880-10285 09  
 Basic cluster compression algorithm  
 NPO-14816 880-10291 09  
 Image-based information, communication, and retrieval  
 NPO-14893 880-10293 09  
 An image-data-compression algorithm  
 NPO-14496 880-10438 09  
 Evaluating computer-drawn ground-cover maps  
 KSC-11195 880-10555 09
- LANGUAGE PROGRAMMING**  
 DDL: Digital systems design language  
 M-FS-25352 880-10163 01
- LAPLACE TRANSFORMATION**  
 An approximation for inverse Laplace transforms  
 MSC-18867 880-10553 09
- LARGE SCALE INTEGRATION**  
 A general logic structure for custom LSI'S  
 NPO-14410 880-10118 08  
 LSI logic for phase-control rectifiers  
 M-FS-25208 880-10161 01  
 Optimizing costs of VLSI circuits  
 M-FS-25348 880-10281 08  
 An automated oxide and diffusion facility for IC's  
 M-FS-25357 880-10282 08
- LASER APPLICATIONS**  
 Laser-fluorescence measurement of marine algae  
 LANGLEY-12282 880-10213 05  
 Changes in 'thermal lens' measure diffusivity  
 NPO-14657 880-10218 06  
 Simultaneous measurement of three atmospheric pollutants  
 NPO-14828 880-10359 04  
 Laser beam methane detector  
 NPO-14929 880-10363 04
- LASER DOPPLER VELOCIMETERS**  
 Noise suppression in forward-scattering optical instruments  
 LANGLEY-12730 880-10324 03
- LASER HEATING**  
 Changes in 'thermal lens' measure diffusivity  
 NPO-14657 880-10218 06
- LASER MODE LOCKING**  
 Tunable pulsed carbon dioxide laser  
 NPO-14984 880-10458 03

**LASER OUTPUTS**

- Powerful copper chloride laser  
NPO-14782 B80-10330 03  
Gas-laser power monitor  
LANGLEY-12682 B80-10455 03

**LASER RANGE FINDERS**

- Short-range self-pulsed optical radar  
NPO-14901 B80-10459 03

**LASERS**

- Large-volume multiple-path  
nuclear-pumped laser  
LANGLEY-12592 B80-10044 03  
Far-field radiation pattern of tunable  
diode lasers  
LANGLEY-12631 B80-10177 03  
Ohmic contact to GaAs semiconductor  
LANGLEY-12466 B80-10263 08  
Diplexer for laser-beam heterodyne  
receiver  
GSFC-12589 B80-10329 03  
Tunable pulsed carbon dioxide laser  
NPO-14984 B80-10458 03

**LATCHES**

- Clamshell door system  
MSC-18468 B80-10101 07

**LEG (ANATOMY)**

- Microprocessor-controlled ultrasonic  
plethysmograph  
MSC-18759 B80-10500 05

**LENSES**

- Fresnel lenses for ultrasonic inspection  
MSC-18469 B80-10217 06  
Acoustic lens is gas-filled  
NPO-14757 B80-10376 06

**LEVEL (HORIZONTAL)**

- Heat-pipe sensor for remote leveling  
GSFC-12095 B80-10248 07

**LEVEL (QUANTITY)**

- Fast response cryogen level sensor  
MSC-18697 B80-10374 06  
Fiber optic level sensor for cryogenics  
MSC-18674 B80-10375 06

**LIFE (DURABILITY)**

- Predicting lifetime of cast parts  
M-FS-19549 B80-10228 06

**LIFT**

- Three-dimnsional potential flow  
LANGLEY-12623 B80-10090 06

**LIGHT BEAMS**

- Multibeam collimator uses prism stack  
GSFC-12608 B80-10452 03

**LIGHT SCATTERING**

- Noise suppression in forward-scattering  
optical instruments  
LANGLEY-12730 B80-10324 03

**LIGHT TRANSMISSION**

- Safely splicing glass optical fibers  
KSC-11107 B80-10134 08

**LIGHTING EQUIPMENT**

- Direct-current converter for  
gas-discharge lamps  
MSC-18407 B80-10156 01

**LINEARIZATION**

- Linearizing magnetic-amplifier dc  
transducer output  
NPO-14617 B80-10167 02

**LINKAGES**

- Lock for hydraulic actuators  
MSC-18853 B80-10530 07

**LIQUEFIED GASES**

- Fiber optic level sensor for cryogenics  
MSC-18674 B80-10375 06

**LIQUEFIED NATURAL GAS**

- Detection of tanker defects with infrared  
thermography  
LANGLEY-12655 B80-10221 06

- Laser beam methane detector  
NPO-14929 B80-10363 04

**LIQUID HELIUM**

- Cryogenic-storage-tank support  
MSC-14848 B80-10258 07

**LIQUID NITROGEN**

- Lightweight cryogenic vessel  
NPO-14794 B80-10548 08

**LIQUIDS**

- An equation of state for liquids  
NPO-14821 B80-10174 03

**LITHIUM FLUORIDES**

- Cleaving machine for hard crystals  
GSFC-12584 B80-10401 07

**LITHOGRAPHY**

- An automated photolithography facility  
for IC's  
M-FS-25073 B80-10140 08

**LIVESTOCK**

- Beef grading by ultrasound  
NPO-14812 B80-10505 05

**LOAD DISTRIBUTION (FORCES)**

- Flush-mounting technique for composite  
beams  
LANGLEY-12389 B80-10121 08

**LOAD TESTS**

- Eddy-current sensor measures bolt  
loading  
M-FS-19486 B80-10079 06  
Measuring ball-bearing loads  
M-FS-19505 B80-10102 07

**LOADS (FORCES)**

- Self-adjusting mechanical snubbing link  
MSC-16134 B80-10246 07

**LOCKS (FASTENERS)**

- Bayonet plug with ramp-activated lock  
MSC-18526 B80-10247 07  
Lock for hydraulic actuators  
MSC-18853 B80-10530 07

**LOGIC CIRCUITS**

- Independent synchronizer for digital  
decoders  
MSC-16723 B80-10004 01  
LSI logic for phase-control rectifiers  
M-FS-25208 B80-10161 01  
CADAT logic simulation program  
M-FS-25183 B80-10432 08  
CADAT test pattern generator  
M-FS-25066 B80-10433 08  
CADAT field-effect-transistor simulator  
M-FS-25067 B80-10434 08  
CADAT place-and-routine in two  
dimensions  
M-FS-25058 B80-10435 08  
CADAT multiport placement and  
routing  
M-FS-25065 B80-10436 08  
CADAT integrated circuit mask analysis  
M-FS-25054 B80-10437 08  
CADAT network translator  
M-FS-25055 B80-10551 08  
CADAT integrated circuit artwork  
program  
M-FS-25017 B80-10552 08

**LOGIC DESIGN**

- A general logic structure for custom  
LSI's  
NPO-14410 B80-10118 08

**LOOPS**

- Improved code-tracking loop  
MSC-18035 B80-10034 02

**LOW FREQUENCIES**

- Converting a digital filter to its analog  
equivalent  
MSC-18587 B80-10313 02

**LOW GRAVITY MANUFACTURING**

- Reduced gravity favors columnar crystal  
growth  
M-FS-25205 B80-10366 04

**LOW PASS FILTERS**

- Smoothing the output from a DAC  
FRC-11025 B80-10160 01

**LOW TEMPERATURE**

- Spiral-wound gasket forms  
low-temperature seal  
LANGLEY-12315 B80-10543 08

**LUBRICANTS**

- Lubrication handbook  
M-FS-25158 B80-10210 04

**LUBRICATING OILS**

- Additive improves engine-oil  
performance  
GSFC-12327 B80-10065 04

**LUBRICATION**

- Additive improves engine-oil  
performance  
GSFC-12327 B80-10065 04

- Design considerations for mechanical  
face seals

- LEWIS-13146 B80-10233 06

- High-performance, multiroller traction  
drive

- LEWIS-13347 B80-10244 07

**LUMINAIRES**

- Energy-reduction concept for  
incandescent lamps  
MSC-18757 B80-10325 03  
Solar cell is housed in light-bulb  
enclosure  
LEWIS-13418 B80-10442 01

**M****MACHINE ORIENTED LANGUAGES**

- DDL:Digital systems design language  
M-FS-25352 B80-10163 01

**MACHINE TOOLS**

- Precision filament cutter  
LANGLEY-12564 B80-10093 07  
Abrasive drill for resilient materials  
LEWIS-13411 B80-10402 07

**MACHINE-INDEPENDENT PROGRAMS**

- A universal structured-design diagrammer  
LANGLEY-12548 B80-10558 09

**MACHINING**

- Cryogenic machining of polyurethane  
foam  
MSC-18572 B80-10123 08  
A construction technique for wind tunnel  
models  
LANGLEY-12710 B80-10381 06

**MAGNETIC AMPLIFIERS**

- Linearizing magnetic-amplifier dc  
transducer output  
NPO-14617 B80-10167 02

**MAGNETIC CORES**

- Producing gapped-ferrite transformer  
cores  
NPO-14715 B80-10273 08  
Improved magnetic material analyzer  
LEWIS-13493 B80-10384 06

**MAGNETIC MATERIALS**

- Improved magnetic material analyzer  
LEWIS-13493 B80-10384 06

**MAGNETIC MEASUREMENT**

- Improved LEEM ranges over four  
decades  
LANGLEY-12706 B80-10508 06

**MAGNETIC TRANSDUCERS**

Cable-splice detector  
ARC-11291 B80-10074 06  
Transducer for extreme temperatures and pressures  
MSC-18778 B80-10510 06

**MAGNETOMETERS**

Improved LEEM ranges over four decades  
LANGLEY-12706 B80-10508 06

**MAGNETOSPHERE**

NASA charging analyzer program  
LEWIS-12973 B80-10058 03

**MAINTENANCE**

Honing fixture for welded electrodes  
M-FS-19537 B80-10278 08  
Repairing high-temperature glazed tiles  
MSC-18736 B80-10536 08

**MANAGEMENT**

**SYSTEMS**

User's guide to SFTRAN  
LEWIS-13172 B80-10143 09

**MANAGEMENT SYSTEMS**

NASA PERT time II  
LEWIS-13145 B80-10286 09

**MANIPULATORS**

Mechanical hand for gripping objects  
M-FS-23692 B80-10243 07  
Electromechanical slip sensor  
NPO-14654 B80-10253 07  
Remote manipulator with force feed-back  
ARC-11272 B80-10408 07

**MANUFACTURING**

Automated ion implantation for IC's  
M-FS-25193 B80-10139 08  
An automated photolithography facility for IC's  
M-FS-25073 B80-10140 08  
Producing gapped-ferrite transformer cores  
NPO-14715 B80-10273 08  
Determining manufacturing cost from product complexity  
M-FS-25371 B80-10439 09

**MANY BODY PROBLEM**

Equations of motion for coupled n-body systems  
GSFC-12407 B80-10083 06

**MAPS**

Evaluating computer-drawn ground-cover maps  
KSC-11195 B80-10555 09

**MARINE TECHNOLOGY**

Laser-fluorescence measurement of marine algae  
LANGLEY-12282 B80-10213 05

**MASERS**

Integral storage-bulb and microwave cavity for masers  
GSFC-12542 B80-10186 03

**MASS DISTRIBUTION**

Interchangeable spring modules for inertia measurements  
LANGLEY-12402 B80-10386 06

**MATERIAL BALANCE**

Interchangeable spring modules for inertia measurements  
LANGLEY-12402 B80-10386 06

**MATERIALS HANDLING**

Transferring small samples of viscous liquid  
MSC-18533 B80-10069 04  
Mechanical hand for gripping objects  
M-FS-23692 B80-10243 07

Remote manipulator with force feed-back

ARC-11272 B80-10408 07  
Soft container for explosive nuts  
MSC-18871 B80-10532 07  
Lightweight cryogenic vessel  
NPO-14794 B80-10548 08

**MATERIALS RECOVERY**

Chlorinolysis reclaims rubber of waste tires  
NPO-14935 B80-10365 04  
Recycling paper-pulp waste liquors  
NPO-14797 B80-10492 04

**MATERIALS TESTS**

Temperature controller adapts to fatigue tester  
LANGLEY-12393 B80-10378 06  
Environmental testing under load  
LANGLEY-12602 B80-10379 06

**MATHEMATICAL MODELS**

Models of MOS and SOS devices  
M-FS-25153 B80-10141 08

**MATRICES (MATHEMATICS)**

Calculating linear A, B, C, and D matrices from a nonlinear dynamic engine simulation  
LEWIS-13250 B80-10520 06

**MAXIMUM LIKELIHOOD ESTIMATES**

Estimation of incomplete multinomial data  
LANGLEY-12593 B80-10146 09

**MEASUREMENT**

Measuring radiation effects on MOS capacitors  
NPO-14700 B80-10227 06

**MEASURING INSTRUMENTS**

Measuring water properties from a moving boat  
LANGLEY-12325 B80-10073 05  
Eddy-current sensor measures bolt loading  
M-FS-19486 B80-10079 06  
Measuring ball-bearing loads  
M-FS-19505 B80-10102 07  
Electromechanical slip sensor  
NPO-14654 B80-10253 07  
Improved magnetic material analyzer  
LEWIS-13493 B80-10384 06

**MECHANICAL DRIVES**

Design considerations for mechanical face seals  
LEWIS-13146 B80-10233 06  
High-performance, multiroller traction drive  
LEWIS-13347 B80-10244 07  
Compact table-tilting mechanism  
NPO-14800 B80-10411 07  
Torque-wrench extension  
MSC-18769 B80-10414 07

**MECHANICAL PROPERTIES**

Multiple-creep-test apparatus  
GSFC-12561 B80-10080 06  
Examining graphite reinforcement in composites  
MSC-19594 B80-10122 08  
Efficient measurement of shear properties of fiber composites  
LEWIS-13011 B80-10216 06  
Environmental testing under load  
LANGLEY-12602 B80-10379 06

**MECHANICAL SHOCK**

Self-adjusting mechanical snubbing link  
MSC-16134 B80-10246 07

**MEDICAL ELECTRONICS**

Testing EKG electrodes on-line  
MSC-18696 B80-10212 05

Improved ureteral stone fragmentation catheter  
NPO-14745 B80-10370 05

**MEDICAL EQUIPMENT**

Temperature controller for hyperthermia devices  
LANGLEY-12528 B80-10072 05  
Cardiopulmonary data-acquisition system  
MSC-18783 B80-10499 05  
Microprocessor-controlled ultrasonic plethysmograph  
MSC-18759 B80-10500 05  
Microprocessor-based cardiometer  
MSC-18775 B80-10501 05  
Fiber-optics couple arthroscope to TV  
LANGLEY-12718 B80-10504 05

**MERCURY LAMPS**

Direct-current converter for gas-discharge lamps  
MSC-18407 B80-10156 01

**METAL BONDING**

Room-temperature adhesive for high-temperature use  
MSC-16930 B80-10129 08  
Time-shaped RF brazing  
MSC-18617 B80-10272 08  
Arc spraying solderable tabs to glass  
NPO-14853 B80-10544 08

**METAL COATINGS**

Improved metallic and thermal barrier coatings  
LEWIS-13324 B80-10353 04

**METAL MATRIX COMPOSITES**

Composites for aeropropulsion  
LEWIS-13438 B80-10209 04

**METAL OXIDE SEMICONDUCTORS**

Models of MOS and SOS devices  
M-FS-25153 B80-10141 08  
Model for MOS field-time-dependent breakdown  
NPO-14701 B80-10162 01  
Measuring radiation effects on MOS capacitors  
NPO-14700 B80-10227 06  
Progress in MOSFET double-layer metalization  
M-FS-25239 B80-10280 08  
Improving MOS minority-carrier lifetime  
NPO-14738 B80-10301 01

**METAL SURFACES**

Detecting contaminants by ultraviolet photography  
M-FS-25296 B80-10229 06

**METAL-METAL BONDING**

Ion-beam cleaning for cold welds  
LEWIS-12982 B80-10115 08

**METALLIZING**

Double metalization for VLSI  
M-FS-25149 B80-10261 08  
Progress in MOSFET double-layer metalization  
M-FS-25239 B80-10280 08

**METALS**

Ion-beam etching enhances adhesive bonding  
LEWIS-13028 B80-10128 08

**METASTABLE STATE**

Containerless materials processing in the laboratory  
M-FS-25242 B80-10059 04

**METEOROLOGICAL FLIGHT**

Airborne meteorological data-collection system  
LEWIS-13346 B80-10314 02

**METEOROLOGICAL SATELLITES**

Microcomputer-based doppler systems  
for weather monitoring  
GSFC-12448 B80-10166 02

**METEOROLOGY**

Instrument measures cloud cover  
NPO-14936 B80-10514 06

**METHANE**

Methane/air flames in a concentric tube  
combustor  
LEWIS-13388 B80-10211 04  
Laser beam methane detector  
NPO-14929 B80-10363 04

**METHOD OF CHARACTERISTICS**

Flow field in supersonic  
mixed-compression inlets  
LEWIS-13279 B80-10088 06

**MICROELECTRONICS**

Improving MOS minority-carrier lifetime  
NPO-14738 B80-10301 01

**MICROMETERS**

Electronic depth micrometer  
KSC-11181 B80-10385 06

**MICROORGANISMS**

Improved microbe detection in water  
samples  
LANGLEY-12709 B80-10502 05

**MICROPARTICLES**

Recording fluid currents by holography  
M-FS-25373 B80-10222 06

**MICROPOROSITY**

Sealing micropores in thin castings  
MSC-18623 B80-10428 08

**MICROPROCESSORS**

Microprocessor systems for industrial  
process control  
NPO-14661 B80-10131 08

**MICROSCOPES**

Vise holds specimens for microscope  
MSC-18690 B80-10098 07

**MICROSTRUCTURE**

Reduced gravity favors columnar crystal  
growth  
M-FS-25205 B80-10366 04

**MICROWAVE ANTENNAS**

Cavity-backed spiral-slot antenna  
MSC-18532 B80-10448 02

**MICROWAVE COUPLING**

One-step microwave foaming and  
curing  
MSC-18707 B80-10420 08  
High-power dual-directional coupler  
NPO-14713 B80-10447 02

**MICROWAVE EQUIPMENT**

Computer-controlled warmup circuit  
NPO-14815 B80-10155 01  
Integral storage-bulb and microwave  
cavity for masers  
GSFC-12542 B80-10186 03  
Portable zero-delay assembly  
NPO-14671 B80-10316 02

**MICROWAVE SWITCHING**

Fast microwave switching power  
divider  
GSFC-12420 B80-10295 01

**MICROWAVE TRANSMISSION**

High-power solid-state microwave  
transmitter  
NPO-14803 B80-10296 01

**MICROWAVE TUBES**

Superconducting gyrocon would be very  
efficient  
NPO-14975 B80-10446 02

**MICROWAVES**

Trislot-cavity microstrip antenna  
MSC-18793 B80-10450 02

**MILLING (MACHINING)**

Chemical-milling solution for invar alloy  
M-FS-25365 B80-10113 08  
'Grinding' cavities in polyurethane foam  
MSC-18564 B80-10124 08

**MINES (EXCAVATIONS)**

Drilling side holes from a borehole  
NPO-14465 B80-10066 04  
Underground Coal Mining  
NPO-14704 B80-10071 04

**MINIATURIZATION**

Miniature personal UV solar dosimeter  
LANGLEY-12469 B80-10321 03

**MINICOMPUTERS**

Low-cost LANDSAT processing system  
M-FS-25396 B80-10285 09  
Common data buffer  
KSC-11048 B80-10303 02

**MINING**

Measuring coal deposits by radar  
M-FS-23922 B80-10060 04  
Detecting a coal/shale interface  
M-FS-23720 B80-10061 04  
Position monitor for mining machines  
M-FS-25342 B80-10157 01

**MINORITY CARRIERS**

Improving MOS minority-carrier lifetime  
NPO-14738 B80-10301 01

**MIRRORS**

Detecting surface faults on solar  
mirrors  
NPO-14684 B80-10230 06  
Low-cost concentrating mirrors  
NPO-14962 B80-10542 08

**MISSION PLANNING**

Goddard mission analysis system  
GSFC-12392 B80-10144 09

**MIST**

Aeolol lasts up to six minutes  
NPO-14947 B80-10360 04

**MIXING**

Quick mixing of epoxy components  
MSC-18731 B80-10415 07

**MODAL RESPONSE**

Rotor transient analysis  
LEWIS-13230 B80-10259 07

**MODULES**

Versatile modular scaffolds  
GSFC-12606 B80-10406 07

**MOLDING MATERIALS**

Producing gapped-ferrite transformer  
cores  
NPO-14715 B80-10273 08

**MOLDS**

Forming complex cavities in clear  
plastic  
LEWIS-13412 B80-10267 08

**MOLYBDENUM SULFIDES**

Self-lubricating gearset  
MSC-18801 B80-10546 08

**MONITORS**

Measuring coal deposits by radar  
M-FS-23922 B80-10060 04  
Fast-response atmospheric-pollutant  
monitor  
LANGLEY-12317 B80-10062 04  
Linearizing magnetic-amplifier dc  
transducer output  
NPO-14617 B80-10167 02

**MOTORS**

A linear magnetic motor and generator  
GSFC-12518 B80-10257 07

**MOUNTING**

New mounting improves solar-cell  
efficiency  
NPO-14467 B80-10039 03

Compact positioning flange

MSC-14876 B80-10104 07

Flush-mounting technique for composite  
beams

LANGLEY-12389 B80-10121 08

Compact table-tilting mechanism

NPO-14800 B80-10411 07

**MULTICHANNEL COMMUNICATION**

28-Channel rotary transformer  
NPO-14861 B80-10300 01

**MULTIPHASE FLOW**

Reduced viscosity interpreted for  
fluid/gas mixtures  
NPO-14976 B80-10457 03

**MULTIPLEXING**

Efficient telemetry format  
NPO-13679 B80-10142 09  
Multiplexed logic controls solar-heating  
system  
M-FS-25287 B80-10318 03

**MULTIPLIERS**

Four-quadrant CCD analog multiplier  
LANGLEY-12332 B80-10305 02  
Monolithic four-quadrant multiplier  
LANGLEY-12330A B80-10306 02

**MULTIPROCESSING (COMPUTERS)**

Online assessment of a distributed  
processor  
KSC-11124 B80-10037 02  
Simultaneous disk storage and retrieval  
KSC-11167 B80-10304 02

**MUSCULAR STRENGTH**

Manual for physical fitness  
MSC-18915 B80-10372 05

**N****NACELLES**

Stream tube curvature analysis  
LANGLEY-11535 B80-10235 06

**NEOPLASMS**

Temperature controller for hyperthermia  
devices  
LANGLEY-12528 B80-10072 05

**NEUTRON BEAMS**

Large-volume multiple-path  
nuclear-pumped laser  
LANGLEY-12592 B80-10044 03

**NICKEL ALLOYS**

Etchant for incoloy-903 welds  
M-FS-19378 B80-10112 08  
A precoat prevents ceramic stopoffs from  
spalling

M-FS-19495 B80-10136 08

Low cost high temperature, duplex

coating for superalloys

LEWIS-13497 B80-10352 04

**NICKEL COATINGS**

A precoat prevents ceramic stopoffs from  
spalling  
M-FS-19495 B80-10136 08

**NITRIC ACID**

Chemical-milling solution for invar alloy  
M-FS-25365 B80-10113 08

**NITROGEN**

Removing freon gas from hydraulic  
fluid

MSC-18740 B80-10494 04

**NOISE REDUCTION**

Suppressing buzz-saw noise in jet  
engines  
LANGLEY-12645 B80-10220 06

Linear stochastic optimal control and  
estimation problem

LEWIS-13206 B80-10287 09

Noise suppression in forward-scattering optical instruments  
 LANGLEY-12730 B80-10324 03  
 Kilovolt vacuum feed through is less noisy  
 NPO-14802 B80-10426 08

**NONDESTRUCTIVE TESTS**  
 X-ray technique verifies weld-root fusion  
 M-FS-19468 B80-10111 08  
 Digital enhancement of X-rays for NDT  
 KSC-11118 B80-10232 06

**NONLINEAR SYSTEMS**  
 Plastic deformation of engines and other nonlinear structures  
 M-FS-23814 B80-10399 06

**NONLINEARITY**  
 Linearizing magnetic-amplifier dc transducer output  
 NPO-14617 B80-10167 02

**NONNEWTONIAN FLOW**  
 Reduced viscosity interpreted for fluid/gas mixtures  
 NPO-14976 B80-10457 03

**NORMAL DENSITY FUNCTIONS**  
 An approximation to student's t-distribution  
 LANGLEY-12238 B80-10284 09

**NOSE CONES**  
 Cap protects aircraft nose cone  
 LANGLEY-12367 B80-10362 04

**NOTCH TESTS**  
 Predicting lifetime of cast parts  
 M-FS-19549 B80-10228 06

**NOZZLE DESIGN**  
 Predicting propulsion system drag  
 LANGLEY-12619 B80-10238 06

**NOZZLE FLOW**  
 Potential flow in two-dimensional deflected nozzles  
 LEWIS-13461 B80-10523 06

**NOZZLE GEOMETRY**  
 Potential flow in two-dimensional deflected nozzles  
 LEWIS-13461 B80-10523 06

**NUCLEAR REACTIONS**  
 Large-volume multiple-path nuclear-pumped laser  
 LANGLEY-12592 B80-10044 03

**NUCLEAR REACTORS**  
 Removal of hydrogen bubbles from nuclear reactors  
 LANGLEY-12597 B80-10205 04

**NUMERICAL ANALYSIS**  
 Numerical tracing of electron trajectories  
 GSFC-12535 B80-10057 03  
 Systems improved numerical differencing analyzer  
 MSC-18597 B80-10148 09

**NUMERICAL CONTROL**  
 Microprocessor systems for industrial process control  
 NPO-14661 B80-10131 08  
 Computer-controlled warmup circuit  
 NPO-14815 B80-10155 01  
 Final report on development of a programmable controller  
 M-FS-25388 B80-10189 03  
 Rain, fog, and clouds for aircraft simulators  
 ARC-11158 B80-10383 06

**NUMERICAL INTEGRATION**  
 Shell theory automated for rotational structures  
 M-FS-23027 B80-10089 06

**NUTS (FASTENERS)**  
 Locknut preload tool  
 MSC-16153 B80-10245 07  
 Wrench for smooth or damaged fasteners  
 MSC-18772 B80-10416 07

## O

**OCEAN SURFACE**  
 Oceanic-wave-measurement system  
 M-FS-23862 B80-10224 06

**OIL ADDITIVES**  
 Additive improves engine-oil performance  
 GSFC-12327 B80-10065 04

**OIL EXPLORATION**  
 Drilling side holes from a borehole  
 NPO-14465 B80-10066 04

**OIL RECOVERY**  
 Downhole pressure sensor  
 NPO-14729 B80-10223 06  
 Sidewall penetrator for oil wells  
 NPO-14306 B80-10528 07

**OPENINGS**  
 Clamshell door system  
 MSC-18468 B80-10101 07

**OPERATIONAL AMPLIFIERS**  
 Low-resistance continuity tester  
 NPO-14881 B80-10445 01

**OPTICAL COMMUNICATION**  
 Safely splicing glass optical fibers  
 KSC-11107 B80-10134 08  
 Diplexer for laser-beam heterodyne receiver  
 GSFC-12589 B80-10329 03  
 Fiber optics transmit clock signal more reliably  
 NPO-14749 B80-10456 03

**OPTICAL DATA PROCESSING**  
 Better-quality CCD-array images  
 NPO-14426 B80-10168 02

**OPTICAL EQUIPMENT**  
 Optical calibrator for TDL spectrometers  
 GSFC-12562 B80-10178 03  
 Noise suppression in forward-scattering optical instruments  
 LANGLEY-12730 B80-10324 03  
 Multibeam collimator uses prism stack  
 GSFC-12608 B80-10452 03

**OPTICAL FILTERS**  
 Acoustically-tuned optical spectrometer  
 HQN-10924 B80-10326 03

**OPTICAL MEASUREMENT**  
 Detecting surface faults on solar mirrors  
 NPO-14684 B80-10230 06

**OPTICAL MEASURING INSTRUMENTS**  
 Noise suppression in forward-scattering optical instruments  
 LANGLEY-12730 B80-10324 03

**OPTICAL RADAR**  
 Short-range self-pulsed optical radar  
 NPO-14901 B80-10459 03

**OPTICAL REFLECTION**  
 Large-volume multiple-path nuclear-pumped laser  
 LANGLEY-12592 B80-10044 03

**OPTICAL TRACKING**  
 An adjustable solar concentrator  
 NPO-14710 B80-10043 03  
 Tracking falling objects  
 NPO-14813 B80-10328 03

**OPTICAL TRANSITION**  
 Fluorescent radiation converter  
 GSFC-12528 B80-10180 03

**OPTICS**  
 Improved multispectral solar cell array  
 HQN-10937 B80-10184 03

**OPTIMIZATION**  
 Structural design with stress and displacement constraints  
 M-FS-25235 B80-10521 06

**ORTHONORMAL FUNCTIONS**  
 An approximation for inverse Laplace transforms  
 MSC-18867 B80-10553 09

**OSCILLATORS**  
 Ultrastable automatic frequency control  
 MSC-18679 B80-10294 01  
 Simple JFET oscillator  
 GSFC-12555 B80-10443 01

**OUTGASSING**  
 All-inorganic spark-chamber frame  
 GSFC-12354 B80-10265 08

**Ovens**  
 An oven for many thermocouple reference junctions  
 FRC-10112 B80-10506 06

**OXIDATION**  
 REDOX electrochemical energy storage  
 LEWIS-13398 B80-10064 04  
 An automated oxide and diffusion facility for IC's  
 M-FS-25357 B80-10282 08

**OXIDATION RESISTANCE**  
 Resin char oxidation retardant for composites  
 LEWIS-13275 B80-10354 04

## P

**PACKAGING**  
 Cost models and economical packaging of LSI's  
 M-FS-25359 B80-10138 08

**PACKINGS (SEALS)**  
 Spiral-wound gasket forms low-temperature seal  
 LANGLEY-12315 B80-10543 08

**PALLADIUM**  
 Removal of hydrogen bubbles from nuclear reactors  
 LANGLEY-12597 B80-10205 04  
 Electrically conductive palladium-containing polyimide films  
 LANGLEY-12629 B80-10357 04

**PANELS**  
 Testing panels in tension and flexure  
 M-FS-25421 B80-10380 06

**PANORAMIC SCANNING**  
 Rotatable prism for pan and tilt  
 LANGLEY-12388 B80-10041 03

**PAPERS**  
 Recycling paper-pulp waste liquors  
 NPO-14797 B80-10492 04

**PARABOLIC BODIES**  
 Offset paraboloidal solar concentrator  
 NPO-14846 B80-10320 03

**PARABOLIC REFLECTORS**  
 Low-cost concentrating mirrors  
 NPO-14962 B80-10542 08

**PARALLEL PROCESSING (COMPUTERS)**  
 Input/output interface module  
 MSC-18180 B80-10159 01



**PARAMETERIZATION**

Determining manufacturing cost from product complexity  
M-FS-25371 880-10439 09

**PARTICLE DENSITY (CONCENTRATION)**

Photographic measurement of droplet density  
M-FS-25326 880-10182 03

**PARTICULATE SAMPLING**

Improved particulate-sampling filter  
NPO-14801 880-10271 08

**PASSIVITY**

Photonitride passivating coating for IC's  
M-FS-25401 880-10260 08  
Silicon nitride passivation of IC's  
M-FS-25309 880-10279 08  
Passivation layer for steel substrate of solar cell  
NPO-14961 880-10541 08

**PENETRATION**

Sidewall penetrator for oil wells  
NPO-14306 880-10528 07

**PENETROMETERS**

Detecting a coal/shale interface  
M-FS-23720 880-10061 04

**PERFORMANCE PREDICTION**

NASA PERT time II  
LEWIS-13145 880-10286 09

**PERFORMANCE TESTS**

Indoor tests of the concentric-tube solar collector  
M-FS-25390 880-10050 03  
Outdoor tests of the concentric-tube collector  
M-FS-25398 880-10191 03  
Finned-absorber solar collector  
M-FS-25385 880-10193 03  
A test program for solar collectors  
M-FS-25433 880-10194 03  
Operational tests of a solar-energy system in Georgia  
M-FS-25420 880-10195 03  
Operational tests of a solar energy system Florida site  
M-FS-25423 880-10196 03  
A hot-water system tested onsite--Togus, Maine  
M-FS-25435 880-10201 03

**PERMEABILITY**

Reduced hydrogen permeability at high temperatures  
LEWIS-13485 880-10364 04

**PHASE CONTROL**

Improved power factor controller  
M-FS-25323 880-10149 01  
Energy saving in ac generators  
M-FS-25302 880-10150 01  
LSI logic for phase-control rectifiers  
M-FS-25208 880-10161 01

**PHASE LOCKED SYSTEMS**

Continuous control of phase-locked-loop bandwidth  
MSC-16684 880-10008 01  
Microprocessor control for phase-lock receiver  
NPO-14438 880-10033 02  
Torque control for electric motors  
MSC-18635 880-10170 02  
Fiber optics transmit clock signal more reliably  
NPO-14749 880-10456 03

**PHASE SHIFT**

Timing signal propagates without phase shift  
MSC-18777 880-10449 02

**PHASE SHIFT KEYING**

Microprocessor-based detector for PSK commands  
NPO-14440 880-10036 02

**PHASE TRANSFORMATIONS**

Combined photovoltaic and thermal-storage module  
NPO-14591 880-10327 03

**PHOTOCHEMICAL REACTIONS**

UV actinometer film  
NPO-14479 880-10179 03  
Photonitride passivating coating for IC's  
M-FS-25401 880-10260 08

**PHOTOCONDUCTIVITY**

Bulk lifetime indicates surface contamination  
NPO-14966 880-10511 06

**PHOTOELECTRIC CELLS**

Solar cell is housed in light-bulb enclosure  
LEWIS-13418 880-10442 01

**PHOTOGRAPHIC FILM**

Automatic 35 mm slide duplicator  
LEWIS-13399 880-10249 07

**PHOTOGRAPHIC MEASUREMENT**

Photographic measurement of droplet density  
M-FS-25326 880-10182 03

**PHOTOGRAPHIC PROCESSING**

Automatic 35 mm slide duplicator  
LEWIS-13399 880-10249 07  
Heat for film processing from solar energy  
M-FS-25444 880-10331 03

**PHOTOGRAPHIC RECORDING**

Recording fluid currents by holography  
M-FS-25373 880-10222 06

**PHOTOGRAPHY**

Camera add-on records time of exposure  
LANGLEY-12635 880-10183 03

**PHOTOMETERS**

Photometer used for response time measurement  
MSC-18712 880-10317 02  
Gas-laser power monitor  
LANGLEY-12682 880-10455 03  
Compact infrared detector  
NPO-14864 880-10515 06

**PHOTOPRODUCTION**

Photoproduction of halogens using platinized TiO<sub>2</sub>  
LANGLEY-12713 880-10491 04

**PHOTOVOLTAIC CELLS**

Photoelectrochemical cell with nondissolving anode  
LANGLEY-12591 880-10038 03  
A survey of photovoltaic systems  
M-FS-25397 880-10187 03  
Multijunction high-voltage solar cell  
LEWIS-13400 880-10441 01

**PHOTOVOLTAIC CONVERSION**

Combined photovoltaic and thermal-storage module  
NPO-14591 880-10327 03

**PHYSICAL EXERCISE**

Manual for physical fitness  
MSC-18915 880-10372 05

**PHYSICAL FITNESS**

Manual for physical fitness  
MSC-18915 880-10372 05

**PHYSIOLOGICAL TESTS**

Miniaturized physiological data telemetry system  
MSC-18804 880-10371 05

Cardiopulmonary data-acquisition system  
MSC-18783 880-10499 05

**PHYSIOLOGY**

Microprocessor-controlled ultrasonic plethysmograph  
MSC-18759 880-10500 05

**PIERCING**

Abrasive drill for resilient materials  
LEWIS-13411 880-10402 07

**PIEZOELECTRIC TRANSDUCERS**

Low-cost calibration of acoustic locators  
LANGLEY-12632 880-10185 03

**PILOT TRAINING**

Rain, fog, and clouds for aircraft simulators  
ARC-11158 880-10383 06

**PIPES (TUBES)**

Tubing cutter for tight spaces  
MSC-18538 880-10099 07  
Flared tube attachment fitting  
MSC-18416 880-10240 07  
Tube flare inspection tool  
MSC-19636 880-10241 07  
Test fittings for dimensionally critical tubes  
NPO-14399 880-10252 07  
Sleeve puller salvages welded tubes  
MSC-18686 880-10256 07  
Shrinking plastic tubing and nonstandard diameters  
MSC-18430 880-10268 08  
Heat-shrinkable sleeve aids in insulating universal joints  
MSC-18685 880-10270 08  
Tube-welder aids  
MSC-18687 880-10277 08  
A construction technique for wind tunnel models  
LANGLEY-12710 880-10381 06  
Reshaping tube ends for welding  
MSC-18462 880-10407 07  
Method for shaping polyethylene tubing  
MSC-18771 880-10423 08

**PLASTIC COATINGS**

UV actinometer film  
NPO-14479 880-10179 03

**PLASTIC DEFORMATION**

Plastic deformation of engines and other nonlinear structures  
M-FS-23814 880-10399 06

**PLASTICIZERS**

Plasticizer for polyimide composites  
LANGLEY-12642 880-10206 04

**PLASTICS**

Ion-beam etching enhances adhesive bonding  
LEWIS-13028 880-10128 08  
Hybrid polymer microspheres  
NPO-14462 880-10208 04  
Forming complex cavities in clear plastic  
LEWIS-13412 880-10267 08  
Shrinking plastic tubing and nonstandard diameters  
MSC-18430 880-10268 08  
Plastic welder  
LANGLEY-12540 880-10274 08

**PLATINUM**

Removal of hydrogen bubbles from nuclear reactors  
LANGLEY-12597 880-10205 04  
Photoproduction of halogens using platinized TiO<sub>2</sub>  
LANGLEY-12713 880-10491 04

**PLETHYSMOGRAPHY**

Microprocessor-controlled ultrasonic  
plethysmograph  
MSC-18759 880-10500 05

**PLUGS**

Bayonet plug with ramp-activated lock  
MSC-18526 880-10247 07

**PNEUMATIC EQUIPMENT**

Method for shaping polyethylene tubing  
MSC-18771 880-10423 08  
Pneumatic-power supply  
MSC-18855 880-10527 07

**POLARIMETERS**

Ultraviolet spectrometer/polarimeter  
M-FS-25298 880-10042 03

**POLARIZATION (WAVES)**

Antenna feed for linear and circular  
polarization  
NPO-14810 880-10297 01

**POLARIZED ELECTROMAGNETIC RADIATION**

Receiving signals of any polarization  
NPO-14836 880-10315 02

**POLARIZED RADIATION**

Dual-frequency bidirectional antenna  
GSFC-12501 880-10154 01

**POLISHING**

Honing fixture for welded electrodes  
M-FS-19537 880-10278 08

**POLLUTION MONITORING**

Measuring water properties from a  
moving boat  
LANGLEY-12325 880-10073 05  
Simultaneous measurement of three  
atmospheric pollutants  
NPO-14828 880-10359 04  
Improved microbe detection in water  
samples  
LANGLEY-12709 880-10502 05

**POLYAMIDE RESINS**

One-step microwave foaming and  
curing  
MSC-18707 880-10420 08

**POLYCARBONATES**

Cap protects aircraft nose cone  
LANGLEY-12367 880-10362 04

**POLYETHYLENES**

Method for shaping polyethylene tubing  
MSC-18771 880-10423 08

**POLYIMIDE RESINS**

A new family of fire-resistant foams  
MSC-16921 880-10418 08  
Modified fire-resistant foams for seat  
cushions  
MSC-18704 880-10419 08  
Rigid fire-resistant foams for walls and  
floors  
MSC-18708 880-10421 08

**POLYIMIDES**

Plasticizer for polyimide composites  
LANGLEY-12642 880-10206 04  
Electrically conductive  
palladium-containing polyimide films  
LANGLEY-12629 880-10357 04  
Aluminum ions enhance polyimide  
adhesive  
LANGLEY-12640 880-10358 04  
Self-lubricating gearset  
MSC-18801 880-10546 08

**POLYMER CHEMISTRY**

Heat resistant polyphosphazene  
polymers  
ARC-11176 880-10350 04

**POLYMERIC FILMS**

UV actinometer film  
NPO-14479 880-10179 03

**POLYPHENYLS**

Room-temperature adhesive for  
high-temperature use  
MSC-16930 880-10129 08

**POLYQUINOXALINES**

Room-temperature adhesive for  
high-temperature use  
MSC-16930 880-10129 08

**POLYURETHANE FOAM**

Cryogenic machining of polyurethane  
foam  
MSC-18572 880-10123 08  
'Grinding' cavities in polyurethane foam  
MSC-18564 880-10124 08  
Foam-filled cushions for sliding trays  
MSC-18565 880-10127 08

**POROUS MATERIALS**

Compact, super heat exchanger  
LEWIS-12441 880-10081 06

**PORTABLE EQUIPMENT**

Pneumatic-power supply  
MSC-18855 880-10527 07

**POSITION (LOCATION)**

Crossed-grid charge locator  
M-FS-25170 880-10010 01  
Microcomputer-based doppler systems  
for weather monitoring  
GSFC-12448 880-10166 02

**POSITION INDICATORS**

Position monitor for mining machines  
M-FS-25342 880-10157 01

**POSITIONING**

Compact positioning flange  
MSC-14876 880-10104 07

**POSITIONING DEVICES (MACHINERY)**

Drill-motor holding fixture  
MSC-18582 880-10108 07  
Jig for assembling large composite  
panels  
LANGLEY-12394 880-10119 08

**POTENTIAL FLOW**

Three-dimensional potential flow  
LANGLEY-12623 880-10090 06  
Potential flow in two-dimensional  
deflected nozzles  
LEWIS-13461 880-10523 06

**POWER CONDITIONING**

Fast microwave switching power  
divider  
GSFC-12420 880-10295 01

**POWER EFFICIENCY**

Improved power factor controller  
M-FS-25323 880-10149 01

**POWER LIMITERS**

Voltage controller/current limiter for ac  
NPO-13061 880-10032 02

**POWER LINES**

Handtool assists in bundling cables  
MSC-18567 880-10255 07

**POWER SUPPLY CIRCUITS**

Frequency-controlled voltage regulator  
NPO-13633 880-10171 02  
Efficient, lightweight dc/dc switching  
converter  
LEWIS-12809 880-10299 01

**PREFORMS**

Hot forming graphite/polyimide  
structures  
LANGLEY-12547 880-10422 08

**PREIMPREGNATION**

Plasticizer for polyimide composites  
LANGLEY-12642 880-10206 04

**PRESSING (FORMING)**

Knife-edge seal for vacuum bagging  
M-FS-24049 880-10135 08

**PRESSURE**

An equation of state for liquids  
NPO-14821 880-10174 03

**PRESSURE DISTRIBUTION**

Three-dimensional potential flow  
LANGLEY-12623 880-10090 06  
Stream tube curvature analysis  
LANGLEY-11535 880-10235 06

**PRESSURE EFFECTS**

Wind-simulation tester for solar  
modules  
NPO-14837 880-10517 06

**PRESSURE REGULATORS**

Pneumatic-power supply  
MSC-18855 880-10527 07

**PRESSURE SENSORS**

Downhole pressure sensor  
NPO-14729 880-10223 06

**PRESSURE VESSELS**

Integral storage-bulb and microwave  
cavity for masers  
GSFC-12542 880-10186 03

**PRESSURE WELDING**

Resistance welding graphite-fiber  
composites  
MSC-18534 880-10264 08

**PRETREATMENT**

Sealing micropores in thin castings  
MSC-18623 880-10428 08

**PRINTED CIRCUITS**

Low-resistance continuity tester  
NPO-14881 880-10445 01

**PRISMS**

Rotatable prism for pan and tilt  
LANGLEY-12388 880-10041 03  
Diplexer for laser-beam heterodyne  
receiver  
GSFC-12589 880-10329 03  
Multibeam collimator uses prism stack  
GSFC-12608 880-10452 03

**PROBABILITY THEORY**

Estimation of incomplete multinomial  
data  
LANGLEY-12593 880-10146 09

**PROBLEM SOLVING**

Linear stochastic optimal control and  
estimation problem  
LEWIS-13206 880-10287 09

**PRODUCTION ENGINEERING**

Microprocessor systems for industrial  
process control  
NPO-14661 880-10131 08

**PRODUCTION MANAGEMENT**

Determining manufacturing cost from  
product complexity  
M-FS-25371 880-10439 09

**PRODUCTIVITY**

Underground Coal Mining  
NPO-14704 880-10071 04

**PROGRAMMING LANGUAGES**

User's guide to SFTRAN  
LEWIS-13172 880-10143 09  
Software design and documentation  
language  
NPO-14610 880-10145 09  
MBASIC processor  
NPO-14245 880-10290 09  
OCCULT-ORSER complete  
conversational user-language translator  
GSFC-12604 880-10556 09

**PROJECT MANAGEMENT**

NASA PERT time II  
LEWIS-13145 880-10286 09

**PROPULSION SYSTEM CONFIGURATIONS**

Predicting propulsion system drag  
LANGLEY-12619 880-10238 06

**PROPULSION SYSTEM PERFORMANCE**

Calculating linear A, B, C, and D matrices from a nonlinear dynamic engine simulation  
LEWIS-13250 B80-10520 06

**PROTECTIVE COATINGS**

Coatings for hybrid microcircuits  
M-FS-25292 B80-10116 08  
Alumina barrier for vacuum brazing  
MSC-18528 B80-10125 08  
A precoat prevents ceramic stopoffs from spalling  
M-FS-19495 B80-10136 08  
Low cost high temperature, duplex coating for superalloys  
LEWIS-13497 B80-10352 04  
Improved metallic and thermal barrier coatings  
LEWIS-13324 B80-10353 04  
Film coatings for contoured surfaces  
MSC-18784 B80-10425 08  
Passivation layer for steel substrate of solar cell  
NPO-14961 B80-10541 08

**PROXIMITY**

The 3-D guidance system with proximity sensors  
NPO-14521 B80-10250 07

**PULMONARY CIRCULATION**

Cardiopulmonary data-acquisition system  
MSC-18783 B80-10499 05

**PULSE COMPRESSION**

Pulse-shaping circuit for laser excitation  
NPO-14556 B80-10453 03

**PULSE GENERATORS**

Ultrasonic frequency analysis  
LANGLEY-12697 B80-10377 06  
Pulse-shaping circuit for laser excitation  
NPO-14556 B80-10453 03

**PULSED LASERS**

Tunable pulsed carbon dioxide laser  
NPO-14984 B80-10458 03

**PUMPS**

Dynamics of cavitating cascades and inducer pumps  
M-FS-25399 B80-10392 06

**PURIFICATION**

Treating domestic wastewater with water hyacinths  
M-FS-23964 B80-10368 05  
Driving bubbles out of glass  
M-FS-25414 B80-10496 04

**PYLONS**

Passive wing/store flutter suppression  
LANGLEY-12468 B80-10219 06

**PYROTECHNICS**

Soft container for explosive nuts  
MSC-18871 B80-10532 07

**Q**

**QUALITY CONTROL**

Controlling the shape of glass microballoons  
M-FS-25230 B80-10266 08

**R**

**RACKS (FRAMES)**

Versatile modular scaffolds  
GSFC-12606 B80-10406 07

**RADAR**

Short-range self-pulsed optical radar  
NPO-14901 B80-10459 03

**RADAR MEASUREMENT**

Measuring coal deposits by radar  
M-FS-23922 B80-10060 04

**RADIANT HEATING**

Operational tests of a solar energy system Florida site  
M-FS-25423 B80-10196 03  
A solar-energy system in Pennsylvania  
M-FS-25427 B80-10197 03  
Installation guidelines for the Pennsylvania system  
M-FS-25424 B80-10198 03  
A solar-energy system in Minnesota  
M-FS-25428 B80-10199 03  
Solar-energy system evaluation-Pennsylvania site  
M-FS-25434 B80-10200 03  
A hot-water system tested onsite--Togus, Maine  
M-FS-25435 B80-10201 03  
A reliable solar-heating system--Huntsville, Alabama  
M-FS-25431 B80-10202 03  
Solar-heating and cooling demonstration project  
M-FS-25443 B80-10203 03  
Mobile glazing unit  
KSC-11171 B80-10538 08

**RADIATION DETECTORS**

Crossed-grid charge locator  
M-FS-25170 B80-10010 01

**RADIATION EFFECTS**

Measuring radiation effects on MOS capacitors  
NPO-14700 B80-10227 06

**RADIATION MEASUREMENT**

Miniature personal UV solar dosimeter  
LANGLEY-12469 B80-10321 03  
Economical ultraviolet radiometer  
NPO-14843 B80-10322 03  
Field limiter for solar radiometers  
NPO-14781 B80-10454 03

**RADIATION**

**INSTRUMENTS**

Far-field radiation pattern of tunable diode lasers  
LANGLEY-12631 B80-10177 03  
All-inorganic spark-chamber frame  
GSFC-12354 B80-10265 08

**RADIATIVE HEAT TRANSFER**

Holes help control temperature  
GSFC-12618 B80-10373 06

**RADIO FREQUENCY HEATING**

Time-shaped RF brazing  
MSC-18617 B80-10272 08

**RADIO TELEMETRY**

Receiver array for high-rate telemetry  
NPO-14579 B80-10308 02  
Receiving signals of any polarization  
NPO-14836 B80-10315 02

**RADIOGRAPHY**

X-ray beam pointer  
MSC-18590 B80-10254 07

**RADIOMETERS**

Economical ultraviolet radiometer  
NPO-14843 B80-10322 03  
Field limiter for solar radiometers  
NPO-14781 B80-10454 03  
Gas-laser power monitor  
LANGLEY-12682 B80-10455 03  
Compact infrared detector  
NPO-14864 B80-10515 06

**RANDOM ACCESS MEMORY**

RAM-Based frame synchronizer  
GSFC-12430 B80-10164 02  
RAM-Based parallel-output controller  
GSFC-12447 B80-10165 02

**RANGE FINDERS**

Short-range self-pulsed optical radar  
NPO-14901 B80-10459 03

**READOUT**

Monolithic CCD-array readout  
LANGLEY-12376 B80-10307 02

**REAL TIME OPERATION**

Simultaneous disk storage and retrieval  
KSC-11167 B80-10304 02

**RECEIVERS**

Microprocessor control for phase-lock receiver  
NPO-14438 B80-10033 02  
Receiver array for high-rate telemetry  
NPO-14579 B80-10308 02  
Arrayed receivers for low-rate telemetry  
NPO-14590 B80-10309 02  
Receiving signals of any polarization  
NPO-14836 B80-10315 02

**RECLAMATION**

Chlorinolysis reclaims rubber of waste tires  
NPO-14935 B80-10365 04

**RECORDING**

Real-time film recording from stroke-written CRT's  
LANGLEY-12529 B80-10169 02

**RECTIFIERS**

LSI logic for phase-control rectifiers  
M-FS-25208 B80-10161 01

**RECYCLING**

Chlorinolysis reclaims rubber of waste tires  
NPO-14935 B80-10365 04  
Treating domestic wastewater with water hyacinths  
M-FS-23964 B80-10368 05  
Recycling paper-pulp waste liquors  
NPO-14797 B80-10492 04

**REDUCTION (CHEMISTRY)**

REDOX electrochemical energy storage  
LEWIS-13398 B80-10064 04

**REDUNDANCY**

Toggle signal for prevention of control errors  
MSC-18779 B80-10312 02

**REDUNDANT COMPONENTS**

A redundant regulator control with low standby losses  
NPO-13165 B80-10172 02  
Four-wheel dual braking for automobiles  
LANGLEY-12687 B80-10529 07

**REFLECTOMETERS**

Detecting a coal/shale interface  
M-FS-23720 B80-10061 04

**REFLECTORS**

Low-cost concentrating mirrors  
NPO-14962 B80-10542 08

**REFRACTIVITY**

Changes in 'thermal lens' measure diffusivity  
NPO-14657 B80-10218 06

**REFRACTORY MATERIALS**

Thermal barrier and gas seal  
MSC-18390 B80-10269 08  
Tile densification with TEOS  
MSC-18737 B80-10535 08  
Repairing high-temperature glazed tiles  
MSC-18736 B80-10536 08

**REGENERATION (ENGINEERING)**

Regenerative superheated steam turbine cycles  
LEWIS-13392 880-10234 06

**REGRESSION ANALYSIS**

Multiple linear regression analysis  
M-FS-23764 880-10288 09

**RELIABILITY**

A redundant regulator control with low standby losses  
NPO-13165 880-10172 02

**REMOTE CONTROL**

The 3-D guidance system with proximity sensors  
NPO-14521 880-10250 07  
Electromechanical slip sensor  
NPO-14654 880-10253 07

**REMOTE HANDLING**

Mechanical hand for gripping objects  
M-FS-23692 880-10243 07  
Remote manipulator with force feed-back  
ARC-11272 880-10408 07

**REMOTE SENSORS**

Applications of remote-sensing imagery  
M-FS-25107 880-10082 06  
Laser-fluorescence measurement of marine algae  
LANGLEY-12282 880-10213 05  
Heat-pipe sensor for remote leveling  
GSFC-12095 880-10248 07  
Evaluating computer-drawn ground-cover maps  
KSC-11195 880-10555 09

**RENDEZVOUS SPACECRAFT**

High-power dual-directional coupler  
NPO-14713 880-10447 02

**REPORTS**

Final report on development of a programmable controller  
M-FS-25388 880-10189 03  
Finned-absorber solar collector  
M-FS-25385 880-10193 03

**REPRODUCTION (COPYING)**

Automatic 35 mm slide duplicator  
LEWIS-13399 880-10249 07

**RESILIENCY**

Abrasive drill for resilient materials  
LEWIS-13411 880-10402 07

**RESISTANCE HEATING**

Easily-assembled helical heater  
LANGLEY-11712 880-10130 08

**RESPONSE TIME (COMPUTERS)**

Photometer used for response time measurement  
MSC-18712 880-10317 02

**RETAINING**

Retaining a sleeve on a shaft  
M-FS-19518 880-10103 07

**REUSE**

Sleeve puller salvages welded tubes  
MSC-18686 880-10256 07

**RIBBONS**

Handtool assists in bundling cables  
MSC-18567 880-10255 07

**RIBS (SUPPORTS)**

Shaping graphite/epoxy stiffeners  
MSC-18494 880-10120 08

**RING STRUCTURES**

Eliminating gaps in split rings  
MSC-18854 880-10540 08

**RISK**

Estimation of incomplete multinomial data  
LANGLEY-12593 880-10146 09

**RODS**

Lock for hydraulic actuators  
MSC-18853 880-10530 07

**ROLLER BEARINGS**

Cylindrical bearing analysis  
LEWIS-13393 880-10533 07

**ROLLERS**

High-performance, multiroller traction drive  
LEWIS-13347 880-10244 07

**ROLLING CONTACT LOADS**

Cylindrical bearing analysis  
LEWIS-13393 880-10533 07

**ROTARY WINGS**

Isolation and measurement of rotor vibration forces  
LANGLEY-12476 880-10507 06

**ROTATING SHAFTS**

28-Channel rotary transformer  
NPO-14861 880-10300 01

**ROTORS**

Rotor transient analysis  
LEWIS-13230 880-10259 07

**RUBBER**

Chlorinolysis reclaims rubber of waste tires  
NPO-14935 880-10365 04

**RUGGEDNESS**

Self-lubricating gearset  
MSC-18801 880-10546 08

**RUNNING**

Manual for physical fitness  
MSC-18915 880-10372 05

**S**

**SAFETY DEVICES**

Cable-splice detector  
ARC-11291 880-10074 06

**SAFETY FACTORS**

Safety analysis for complex systems  
MSC-18745 880-10554 09

**SAMPLING**

Better-quality CCD-array images  
NPO-14426 880-10168 02  
Improved particulate-sampling filter  
NPO-14801 880-10271 08

**SANDWICH STRUCTURES**

Lightweight terminal board  
MSC-18787 880-10429 08  
Heat pipes cool probe and sandwich panel  
LANGLEY-12588; LANGLEY-12637 880-10518 06

**SAPPHIRE**

More-reliable SOS ion implantations  
M-FS-25322 880-10262 08

**SATELLITE OBSERVATION**

Ultraviolet spectrometer/polarimeter  
M-FS-25298 880-10042 03

**SATELLITE-BORNE INSTRUMENTS**

Applications of remote-sensing imagery  
M-FS-25107 880-10082 06

**SCHOOLS**

Learning high-quality soldering  
NPO-14869 880-10539 08

**SCINTILLATION COUNTERS**

Multiple-creep-test apparatus  
GSFC-12561 880-10080 06

**SCREWS**

Self-energized screw coupling  
M-FS-25340 880-10096 07

**SCRUBBERS**

Carbon scrubber  
MSC-16531 880-10356 04

**SEA ROUGHNESS**

Oceanic-wave-measurement system  
M-FS-23862 880-10224 06

**SEALING**

Sealing micropores in thin castings  
MSC-18623 880-10428 08  
Transistor package for high pressure applications  
MSC-18743 880-10430 08  
Spiral-wound gasket forms  
LANGLEY-12315 880-10543 08

**SEALS (STOPPERS)**

Self-acting shaft seals  
LEWIS-13229 880-10109 07  
Knife-edge seal for vacuum bagging  
M-FS-24049 880-10135 08  
Design considerations for mechanical face seals  
LEWIS-13146 880-10233 06  
Thermal barrier and gas seal  
MSC-18390 880-10269 08  
Heat/pressure seal for moving parts  
MSC-18422 880-10390 06

**SELF LUBRICATING MATERIALS**

Self-lubricating gearset  
MSC-18801 880-10546 08

**SEMICONDUCTING FILMS**

'Pelled-film' solar cells  
NPO-14734 880-10151 01

**SEMICONDUCTOR DEVICES**

Photocapacitive image converter  
LANGLEY-12513 880-10009 01  
Semiconductor step-stress testing  
M-FS-25329 880-10011 01  
JANTX1N2970B zener diode  
M-FS-25260 880-10012 01  
JANTX1N2989B zener diode  
M-FS-25261 880-10013 01  
JANTX1N3016B zener diode  
M-FS-25262 880-10014 01  
JANTX1N3031B zener diode  
M-FS-25263 880-10015 01  
JANTX1N5622 diode  
M-FS-25280 880-10016 01  
JANTX1N5623 switching diode  
M-FS-25281 880-10017 01  
JANTX2N2060 dual transistor  
M-FS-25251 880-10018 01  
JANTX2N2219A dual transistor  
M-FS-25252 880-10019 01  
JANTX2N2369A transistor  
M-FS-25254 880-10020 01  
JANTX2N2432A transistor  
M-FS-26255 880-10021 01  
JANTX2N2484 transistor  
M-FS-25253 880-10022 01  
JANTX2N2605 transistor  
M-FS-25150 880-10023 01  
JANTX2N2905A transistor  
M-FS-25256 880-10024 01  
JANTX2N2920 Dual transistor  
M-FS-25258 880-10025 01  
JANTX2N2945A transistor  
M-FS-25259 880-10026 01  
JANTX2N3637 transistor  
M-FS-25264 880-10027 01  
JANTX2N3811 dual transistor  
M-FS-25265 880-10028 01  
JANTX2N4150 transistor  
M-FS-25267 880-10029 01  
JANTX2N4856 field-effect transistor  
M-FS-25269 880-10030 01  
Model for MOS field-time-dependent breakdown  
NPO-14701 880-10162 01

Ohmic contact to GaAs semiconductor  
**LANGLEY-12466** B80-10263 08

**SENSORY FEEDBACK**  
 Remote manipulator with force  
 feed-back  
**ARC-11272** B80-10408 07

**SEQUENCING**  
 Multipath star switch controller  
**NPO-13422** B80-10035 02

**SERVOCONTROL**  
 Photometer used for response time  
 measurement  
**MSC-18712** B80-10317 02

**SETUPS**  
 Wire harness twisting aid  
**MSC-18581** B80-10132 08

**SHAFTS (MACHINE ELEMENTS)**  
 Retaining a sleeve on a shaft  
**M-FS-19518** B80-10103 07  
 Self-acting shaft seals  
**LEWIS-13229** B80-10109 07

**SHALES**  
 Detecting a coal/shale interface  
**M-FS-23720** B80-10061 04

**SHAPERS**  
 Shaping graphite/epoxy stiffeners  
**MSC-18494** B80-10120 08  
 Controlling the shape of glass  
 microballoons  
**M-FS-25230** B80-10266 08  
 Reshaping tube ends for welding  
**MSC-18462** B80-10407 07

**SHAPES**  
 Contour-measuring tool for composite  
 layups  
**ARC-11246** B80-10417 08

**SHEAR PROPERTIES**  
 Efficient measurement of shear properties  
 of fiber composites  
**LEWIS-13011** B80-10216 06  
 Biaxial method for in-plane shear  
 testing  
**LANGLEY-12680** B80-10512 06

**SHELL THEORY**  
 Shell theory automated for rotational  
 structures  
**M-FS-23027** B80-10089 06

**SHOCK ABSORBERS**  
 Self-adjusting mechanical snubbing link  
**MSC-16134** B80-10246 07

**SHOCK WAVE CONTROL**  
 Suppressing buzz-saw noise in jet  
 engines  
**LANGLEY-12645** B80-10220 06

**SHORT CIRCUITS**  
 Detecting short circuits during  
 assembly  
**ARC-11116** B80-10007 01  
 Voltage controller/current limiter for ac  
**NPO-13061** B80-10032 02

**SHRINKAGE**  
 Shrinking plastic tubing and nonstandard  
 diameters  
**MSC-18430** B80-10268 08

**SIGNAL PROCESSING**  
 Improved code-tracking loop  
**MSC-18035** B80-10034 02  
 Smoothing the output from a DAC  
**FRC-11025** B80-10160 01

**SIGNAL RECEPTION**  
 Receiving signals of any polarization  
**NPO-14836** B80-10315 02

**SIGNAL TO NOISE RATIOS**  
 Real-time image enhancement  
**NPO-14281** B80-10311 02

Noise suppression in forward-scattering  
 optical instruments  
**LANGLEY-12730** B80-10324 03

**SIGNAL TRANSMISSION**  
 Receiver array for high-rate telemetry  
**NPO-14579** B80-10308 02  
 Compressing TV-image data  
**NPO-14823** B80-10310 02

**SILICON**  
 More-reliable SOS ion implantations  
**M-FS-25322** B80-10262 08  
 Producing silicon continuously  
**NPO-14796** B80-10537 08  
 Back contacts for silicon-on-ceramic  
 solar cells  
**NPO-14809** B80-10545 08  
 Nickel-doped silicon for solar cells  
**NPO-14780** B80-10550 08

**SILICON COMPOUNDS**  
 Tile densification with TEOS  
**MSC-18737** B80-10535 08  
 Repairing high-temperature glazed tiles  
**MSC-18736** B80-10536 08

**SILICON NITRIDES**  
 Photonnitride passivating coating for IC's  
**M-FS-25401** B80-10260 08  
 Silicon nitride passivation of IC's  
**M-FS-25309** B80-10279 08

**SILICONES**  
 A reliable solar-heating  
 system--Huntsville, Alabama  
**M-FS-25431** B80-10202 03  
 New pressure-sensitive silicone  
 adhesive  
**LANGLEY-12737** B80-10495 04

**SILICONIZING**  
 Coatings for hybrid microcircuits  
**M-FS-25292** B80-10116 08  
 Photonnitride passivating coating for IC's  
**M-FS-25401** B80-10260 08

**SIMULATION**  
 CADAT logic simulation program  
**M-FS-25183** B80-10432 08  
 CADAT field-effect-transistor simulator  
**M-FS-25067** B80-10434 08  
 Wind-simulation tester for solar  
 modules  
**NPO-14837** B80-10517 06

**SINTERING**  
 Double metalization for VLSI  
**M-FS-25149** B80-10261 08

**SIZE DETERMINATION**  
 Resizing structures for minimum weight  
**LANGLEY-12699** B80-10394 06

**SIZING (SHAPING)**  
 Shrinking plastic tubing and nonstandard  
 diameters  
**MSC-18430** B80-10268 08

**SLEEVES**  
 Retaining a sleeve on a shaft  
**M-FS-19518** B80-10103 07  
 Sleeve puller salvages welded tubes  
**MSC-18686** B80-10256 07  
 Heat-shrinkable sleeve aids in insulating  
 universal joints  
**MSC-18685** B80-10270 08  
 Aligning sleeve for optical fibers  
**MSC-18756** B80-10424 01

**SLICING**  
 Precision filament cutter  
**LANGLEY-12564** B80-10093 07

**SLIDING**  
 Electromechanical slip sensor  
**NPO-14654** B80-10253 07

**SLOT ANTENNAS**  
 Cavity-backed spiral-slot antenna  
**MSC-18532** B80-10448 02

Trislot-cavity microstrip antenna  
**MSC-18793** B80-10450 02

**SLUDGE**  
 Removing freon gas from hydraulic  
 fluid  
**MSC-18740** B80-10494 04

**SNELLS LAW**  
 Refraction corrections for surveying  
**MSC-18664** B80-10231 06

**SODIUM IODIDES**  
 Multiple-creep-test apparatus  
**GSFC-12561** B80-10080 06

**SOLAR CELLS**  
 Photoelectrochemical cell with  
 nondissolving anode  
**LANGLEY-12591** B80-10038 03  
 'Pelled-film' solar cells  
**NPO-14734** B80-10151 01  
 Improved multispectral solar cell array  
**HQN-10937** B80-10184 03  
 A survey of photovoltaic systems  
**M-FS-25397** B80-10187 03  
 Ohmic contact to GaAs semiconductor  
**LANGLEY-12466** B80-10263 08  
 Solar-powered aircraft  
**LANGLEY-126'x5** B80-10404 07  
 Multijunction high-voltage solar cell  
**LEWIS-13400** B80-10441 01  
 Solar cell is housed in light-bulb  
 enclosure  
**LEWIS-13418** B80-10442 01  
 Wind-simulation tester for solar  
 modules  
**NPO-14837** B80-10517 06  
 Passivation layer for steel substrate of  
 solar cell  
**NPO-14961** B80-10541 08  
 Back contacts for silicon-on-ceramic  
 solar cells  
**NPO-14809** B80-10545 08  
 Nickel-doped silicon for solar cells  
**NPO-14780** B80-10550 08

**SOLAR COLLECTORS**  
 Fresnel lens tracking solar collector  
**M-FS-25419** B80-10190 03  
 Outdoor tests of the concentric-tube  
 collector  
**M-FS-25398** B80-10191 03  
 Selective optical coatings for solar  
 collectors  
**M-FS-23589** B80-10192 03  
 Finned-absorber solar collector  
**M-FS-25385** B80-10193 03  
 A test program for solar collectors  
**M-FS-25433** B80-10194 03

**SOLAR ENERGY**  
 New mounting improves solar-cell  
 efficiency  
**NPO-14467** B80-10039 03  
 An adjustable solar concentrator  
**NPO-14710** B80-10043 03  
 Twelve solar-heating/cooling systems:  
 Design and development  
**M-FS-25358** B80-10046 03  
 Solar-heating and cooling system design  
 package  
**M-FS-25393** B80-10047 03  
 Benefit assessment of solar-augmented  
 natural gas systems  
**NPO-14568** B80-10048 03  
 Air-cooled solar-collector specification  
**M-FS-25336** B80-10049 03  
 Indoor tests of the concentric-tube solar  
 collector  
**M-FS-25390** B80-10050 03

- Evacuated-tube solar collector--performance evaluation  
M-FS-25339 880-10051 03  
Glycol/water evacuated-tube solar collector  
M-FS-25337 880-10052 03  
Thermosiphon heat exchanger  
M-FS-25389 880-10053 03  
Controller for solar-energy systems  
M-FS-25386 880-10054 03  
Controller and temperature monitor for solar heating  
M-FS-25387 880-10055 03  
Inhibiting corrosion in solar-heating and cooling systems  
M-FS-25387 880-10056 03  
A survey of photovoltaic systems  
M-FS-25397 880-10187 03  
Thermal stratification in liquid storage tanks  
M-FS-25416 880-10188 03  
Final report on development of a programmable controller  
M-FS-25388 880-10189 03  
Fresnel lens tracking solar collector  
M-FS-25419 880-10190 03  
Outdoor tests of the concentric-tube collector  
M-FS-25398 880-10191 03  
Selective optical coatings for solar collectors  
M-FS-23589 880-10192 03  
Finned-absorber solar collector  
M-FS-25385 880-10193 03  
A test program for solar collectors  
M-FS-25433 880-10194 03  
Operational tests of a solar-energy system in Georgia  
M-FS-25420 880-10195 03  
Operational tests of a solar energy system Florida site  
M-FS-25423 880-10196 03  
A solar-energy system in Pennsylvania  
M-FS-25427 880-10197 03  
Installation guidelines for the Pennsylvania system  
M-FS-25424 880-10198 03  
A solar-energy system in Minnesota  
M-FS-25428 880-10199 03  
Solar-energy system evaluation-Pennsylvania site  
M-FS-25434 880-10200 03  
A hot-water system tested onsite--Togus, Maine  
M-FS-25435 880-10201 03  
A reliable solar-heating system--Huntsville, Alabama  
M-FS-25431 880-10202 03  
Solar-heating and cooling demonstration project  
M-FS-25443 880-10203 03  
Detecting surface faults on solar mirrors  
NPO-14684 880-10230 06  
Multiplexed logic controls solar-heating system  
M-FS-25287 880-10318 03  
Four-cell solar tracker  
NPO-14811 880-10319 03  
Offset paraboloidal solar concentrator  
NPO-14846 880-10320 03  
Heat for film processing from solar energy  
M-FS-25444 880-10331 03  
Solar heater/cooler for mass market  
M-FS-25452 880-10332 03  
Data-acquisition and control system for severe environments  
M-FS-25471 880-10333 03  
Solar heater/cooler for mass market  
M-FS-25468 880-10334 03  
Solar--heated and cooled office building--Dalton, Georgia  
M-FS-25451 880-10335 03  
Solar-heating and hot water system--St. Louis, Missouri  
M-FS-25453 880-10336 03  
Solar heating for an electronics manufacturing plant--Blue Earth, Minnesota  
M-FS-25469 880-10337 03  
Costs and description of a solar-energy system--Austin, Texas  
M-FS-25472 880-10338 03  
Solar energy in a historical city--Abbreville, South Carolina  
M-FS-25479 880-10339 03  
municipal recreation center is heated and cooled by solar energy  
M-FS-25478 880-10340 03  
Solar energy meets 50 percent of motel hot water needs--Key West, Florida  
M-FS-25454 880-10341 03  
Solar heated office complex--Greenwood, South Carolina  
M-FS-25458 880-10342 03  
Residential system tested in an office--Huntsville, Alabama  
M-FS-25481 880-10343 03  
Solar heated two level residence--Akron, Ohio  
M-FS-25480 880-10344 03  
Solar energy workshop--Tucson, Arizona  
M-FS-25473 880-10345 03  
Residential solar hot water system--Tempe, Arizona  
M-FS-25490 880-10346 03  
Residential solar heating installation--Stillwater, Minnesota  
M-FS-25504 880-10347 03  
Three story residence with solar heat--Manchester, New Hampshire  
M-FS-25499 880-10348 03  
A high school is supplied with solar energy--Dallas, Texas  
M-FS-25514 880-10349 03  
Solar-powered aircraft  
LANGLEY-12615 880-10404 07  
Multijunction high-voltage solar cell  
LEWIS-13400 880-10441 01  
Solar-site test module  
M-FS-25543 880-10460 03  
Evaluation of an evacuated-tube liquid solar collector  
M-FS-25450 880-10461 03  
Solar water heater design package  
M-FS-25521 880-10462 03  
Five-city economics of a solar hot-water-system  
M-FS-25532 880-10463 03  
Economic evaluation of a solar hot-water-system  
M-FS-25529 880-10464 03  
Residential solar-heating system uses pyramidal optics  
M-FS-25567 880-10465 03  
Solar-heated bank-Marks Mississippi  
M-FS-25558 880-10466 03  
Solar water-heating performance evaluation--San Diego, California  
M-FS-25502 880-10467 03  
Solar-heated and cooled savings and loan building-1-Leavenworth, Kansas  
M-FS-25520 880-10468 03  
Solar-energy landmark  
Building-Columbia, Missouri  
M-FS-25524 880-10469 03  
Solar heating for an observatory--Lincoln, Nebraska  
M-FS-25525 880-10470 03  
Two-story residence with solar heating--Newman, Georgia  
M-FS-25526 880-10471 03  
Solar-energy heats a transportation test center--Pueblo, Colorado  
M-FS-25527 880-10472 03  
Single-family-residence solar heating--Carlsbad, New Mexico  
M-FS-25528 880-10473 03  
Multimode solar-heating system--Columbia, South Carolina  
M-FS-25552 880-10474 03  
Solar-heated swimming school--Wilmington, Delaware  
M-FS-25548 880-10475 03  
Winter performance of a domestic solar-heating system--Duffield, Virginia  
M-FS-25540 880-10476 03  
One-year assessment of a solar space/water heater--Clinton, Mississippi  
M-FS-25539 880-10477 03  
Fire-station solar-energy system--Kansas City, Missouri  
M-FS-25538 880-10478 03  
Solar-heated ranger station--Glendo, Wyoming  
M-FS-25537 880-10479 03  
Economic evaluation of a solar hot-water system--Palm Beach County, Florida  
M-FS-25536 880-10480 03  
Residential system--Lansing, Michigan  
M-FS-25530 880-10481 03  
Solar space-heating system--Yosemite National Park, California  
M-FS-25553 880-10482 03  
Motel solar-hot-water system--Dallas, Texas  
M-FS-25575 880-10483 03  
Motel solar-hot-water system with nonpressurized storage--Jacksonville, Florida  
M-FS-25569 880-10484 03  
Closed-circulation system for motel hot water--Savannah, Georgia  
M-FS-25572 880-10485 03  
Solar heating for a restaurant--North Little Rock, Arkansas  
M-FS-25568 880-10486 03  
Motel solar hot-water installation--Atlanta, Georgia  
M-FS-25564 880-10487 03  
Building with integral solar-heat storage--Starkville, Mississippi  
M-FS-25559 880-10488 03  
Less-toxic corrosion inhibitors  
M-FS-25496 880-10497 04  
Low-cost concentrating mirrors  
NPO-14962 880-10542 08  
Nickel-doped silicon for solar cells  
NPO-14780 880-10550 08  
**SOLAR ENERGY CONVERSION**  
Field limiter for solar radiometers  
NPO-14781 880-10454 03  
**SOLAR HEATING**  
Final report on development of a programmable controller  
M-FS-25388 880-10189 03

**SOLAR RADIATION**

- Ultraviolet spectrometer/polarimeter  
 M-FS-25298 B80-10042 03  
 Miniature personal UV solar dosimeter  
 LANGLEY-12469 B80-10321 03  
 Economical ultraviolet radiometer  
 NPO-14843 B80-10322 03  
 Field limiter for solar radiometers  
 NPO-14781 B80-10454 03

**SOLAR REFLECTORS**

- Detecting surface faults on solar mirrors  
 NPO-14684 B80-10230 06

**SOLDERING**

- Connector heat shield  
 MSC-16282 B80-10126 08  
 Learning high-quality soldering  
 NPO-14869 B80-10539 08  
 Arc spraying solderable tabs to glass  
 NPO-14853 B80-10544 08

**SOLID LUBRICANTS**

- Lubrication handbook  
 M-FS-25158 B80-10210 04

**SPACE MANUFACTURING**

- Should we industrialize space?  
 M-FS-23963 B80-10137 08

**SPACECRAFT COMMUNICATION**

- High-power dual-directional coupler  
 NPO-14713 B80-10447 02

**SPACECRAFT INSTRUMENTS**

- The 3-D guidance system with proximity sensors  
 NPO-14521 B80-10250 07

**SPALLING**

- A precoat prevents ceramic stopoffs from spalling  
 M-FS-19495 B80-10136 08

**SPARK CHAMBERS**

- All-inorganic spark-chamber frame  
 GSFC-12354 B80-10265 08

**SPECIES DIFFUSION**

- Diffusion in single-phase binary alloys  
 LANGLEY-12665 B80-10498 04

**SPECIMENS**

- Vise holds specimens for microscope  
 MSC-18690 B80-10098 07

**SPECTRAL ENERGY DISTRIBUTION**

- Improved multispectral solar cell array  
 HQN-10937 B80-10184 03

**SPECTROMETERS**

- Fast-response atmospheric-pollutant monitor  
 LANGLEY-12317 B80-10062 04  
 Instrument remotely measures wind velocities  
 NPO-14524 B80-10176 03  
 Optical calibrator for TDL spectrometers  
 GSFC-12562 B80-10178 03  
 Acoustically-tuned optical spectrometer  
 HQN-10924 B80-10326 03  
 Cleaving machine for hard crystals  
 GSFC-12584 B80-10401 07

**SPECTROSCOPIC ANALYSIS**

- Integrated material-surface analyzer  
 NPO-14702 B80-10388 06

**SPECTROSCOPIC TELESCOPES**

- Ultraviolet spectrometer/polarimeter  
 M-FS-25298 B80-10042 03

**SPECTROSCOPY**

- High-resolution spectrometry/interferometer  
 NPO-14448 B80-10175 03

**SPEED CONTROL**

- Speed control for synchronous motors  
 MSC-18680 B80-10444 01

**SPEED REGULATORS**

- Speed control for synchronous motors  
 MSC-18680 B80-10444 01

**SPHERES**

- Hybrid polymer microspheres  
 NPO-14462 B80-10208 04

**SPHERICAL SHELLS**

- Drop tower with no aerodynamic drag  
 NPO-14845 B80-10549 08

**SPIN STABILIZATION**

- Aircraft equilibrium spin characteristics  
 LANGLEY-12502 B80-10087 06

**SPlicing**

- Cable-splice detector  
 ARC-11291 B80-10074 06  
 Safely splicing glass optical fibers  
 KSC-11107 B80-10134 08

**SPRAYED COATINGS**

- Film coatings for contoured surfaces  
 MSC-18784 B80-10425 08

**SPRAYING**

- Spraying suspensions uniformly  
 M-FS-25139 B80-10409 07  
 Pneumatic-power supply  
 MSC-18855 B80-10527 07

**SPRINGS (ELASTIC)**

- Self-energized screw coupling  
 M-FS-25340 B80-10096 07  
 Interchangeable spring modules for inertia measurements  
 LANGLEY-12402 B80-10386 06

**SPUTTERING**

- Improved adherence of TiC coatings to steel  
 LEWIS-13169 B80-10207 04

**STANDARDS**

- A temperature fixed point near 58 C  
 M-FS-25304 B80-10204 04

**STATIC DISCHARGERS**

- More-reliable SOS ion implantations  
 M-FS-25322 B80-10262 08

**STATIC ELECTRICITY**

- Reducing static charges in fluidized bed reactions  
 ARC-11245 B80-10068 04

**STATISTICAL ANALYSIS**

- Estimation of incomplete multinomial data  
 LANGLEY-12593 B80-10146 09  
 Multiple linear regression analysis  
 M-FS-23764 B80-10288 09

**STATISTICAL DISTRIBUTIONS**

- An approximation to student's t-distribution  
 LANGLEY-12238 B80-10284 09

**STATISTICS**

- Multiple linear regression analysis  
 M-FS-23764 B80-10288 09

**STEAM TURBINES**

- Regenerative superheated steam turbine cycles  
 LEWIS-13392 B80-10234 06

**STEELS**

- Improved adherence of TiC coatings to steel  
 LEWIS-13169 B80-10207 04

**STIFFENING**

- Heat-shrinkable sleeve aids in insulating universal joints  
 MSC-18685 B80-10270 08

**STOCHASTIC PROCESSES**

- Linear stochastic optimal control and estimation problem  
 LEWIS-13206 B80-10287 09

**STORAGE TANKS**

- Thermal stratification in liquid storage tanks  
 M-FS-25416 B80-10188 03

- Lightweight cryogenic vessel  
 NPO-14794 B80-10548 08

**STOWAGE (ONBOARD EQUIPMENT)**

- Foam-filled cushions for sliding trays  
 MSC-18565 B80-10127 08

**STRAIN GAGES**

- LVD gage for fracture-toughness tests in liquid hydrogen  
 LEWIS-13038 B80-10075 06  
 Modified displacement gage for cryogenic testing  
 LEWIS-13039 B80-10077 06  
 Signal conditioner for nickel temperature sensors  
 MSC-18367 B80-10298 01

**STRATIFICATION**

- Thermal stratification in liquid storage tanks  
 M-FS-25416 B80-10188 03

**STRESS (PHYSIOLOGY)**

- Cardiopulmonary data-acquisition system  
 MSC-18783 B80-10499 05  
 Microprocessor-based cardiometer  
 MSC-18775 B80-10501 05

**STRESS ANALYSIS**

- Structural design with stress and displacement constraints  
 M-FS-25235 B80-10521 06

**STRESS CONCENTRATION**

- Predicting lifetime of cast parts  
 M-FS-19549 B80-10228 06  
 NASTRAN modifications for recovering strains and curvatures  
 LEWIS-12592 B80-10395 06

**STRESS MEASUREMENT**

- Efficient measurement of shear properties of fiber composites  
 LEWIS-13011 B80-10216 06  
 Biaxial method for in-plane shear testing  
 LANGLEY-12680 B80-10512 06

**STRIP TRANSMISSION LINES**

- Multiband microstrip antenna  
 MSC-18334 B80-10001 01  
 Fast microwave switching power divider  
 GSFC-12420 B80-10295 01

**STRUCTURAL ANALYSIS**

- Shell theory automated for rotational structures  
 M-FS-23027 B80-10089 06  
 Predicting crack propagation  
 MSC-18718; MSC-18721 B80-10283 08  
 NASTRAN modifications for recovering strains and curvatures  
 LEWIS-12592 B80-10395 06  
 Plastic deformation of engines and other nonlinear structures  
 M-FS-23814 B80-10399 06  
 An all-FORTRAN version of NASTRAN for the VAX  
 GSFC-12600 B80-10522 06

**STRUCTURAL DESIGN**

- Resizing structures for minimum weight  
 LANGLEY-12699 B80-10394 06  
 Versatile modular scaffolds  
 GSFC-12606 B80-10406 07  
 Structural design with stress and displacement constraints  
 M-FS-25235 B80-10521 06

**STRUCTURAL MEMBERS**

- Automatic connector for structural beams  
M-FS-25134 880-10094 07
- Mechanical end joint for structural columns  
LANGLEY-12482 880-10095 07
- Shaping graphite/epoxy stiffeners  
MSC-18494 880-10120 08
- Automatic connector joins structural columns  
LANGLEY-12578 880-10251 07
- Lock for hydraulic actuators  
MSC-18853 880-10530 07

**STRUCTURAL VIBRATION**

- Vibration modes and frequencies of structures  
LANGLEY-12647 880-10237 06

**SUBSONIC FLOW**

- A generalized vortex lattice method  
LANGLEY-12636 880-10236 06

**SUPERCOOLING**

- Containerless materials processing in the laboratory  
M-FS-25242 880-10059 04

**SUPERCritical WINGS**

- Transonic airfoil design code  
LANGLEY-12460 880-10085 06

**SUPERHEATING**

- Regenerative superheated steam turbine cycles  
LEWIS-13392 880-10234 06

**SUPERSONIC COMBUSTION RAMJET ENGINES**

- Viscous characteristics analysis  
LANGLEY-12598 880-10084 06

**SUPERSONIC FLOW**

- A generalized vortex lattice method  
LANGLEY-12636 880-10236 06

**SUPERSONIC INLETS**

- Flow field in supersonic mixed-compression inlets  
LEWIS-13279 880-10088 06

**SUPPORTS**

- Drill-motor holding fixture  
MSC-18582 880-10108 07
- Cryogenic-storage-tank support  
MSC-14848 880-10258 07
- Versatile modular scaffolds  
GSFC-12606 880-10406 07
- Compact table-tilting mechanism  
NPO-14800 880-10411 07
- Lock for hydraulic actuators  
MSC-18853 880-10530 07

**SUPPRESSORS**

- Suppressing buzz-saw noise in jet engines  
LANGLEY-12645 880-10220 06

**SURFACE DEFECTS**

- Detecting surface faults on solar mirrors  
NPO-14684 880-10230 06

**SURFACE FINISHING**

- Chemical-milling solution for invar alloy  
M-FS-25365 880-10113 08

**SURFACE PROPERTIES**

- Integrated material-surface analyzer  
NPO-14702 880-10388 06

**SURFACE VEHICLES**

- Improved battery charger for electric vehicles  
NPO-14964 880-10440 01

**SURGERY**

- Improved ureteral stone fragmentation catheter  
NPO-14745 880-10370 05

**SURGES**

- Voltage controller/current limiter for ac  
NPO-13061 880-10032 02

**SURGICAL INSTRUMENTS**

- Improved ureteral stone fragmentation catheter  
NPO-14745 880-10370 05

**SURVEYS**

- A survey of photovoltaic systems  
M-FS-25397 880-10187 03
- Thermal stratification in liquid storage tanks  
M-FS-25416 880-10188 03

**SUSPENDING (MIXING)**

- Spraying suspensions uniformly  
M-FS-25139 880-10409 07

**SWAGING**

- Adjustable base for centering stacked bearings  
MSC-19660 880-10133 08

**SWITCHES**

- Automatic thermal switches  
GSFC-12553 880-10214 06
- Heat switch has no moving parts  
GSFC-12625 880-10391 06

**SWITCHING**

- Multipath star switch controller  
NPO-13422 880-10035 02

**SWITCHING CIRCUITS**

- Energy saving in ac generators  
M-FS-25302 880-10150 01
- Frequency-controlled voltage regulator  
NPO-13633 880-10171 02
- Fast microwave switching power divider  
GSFC-12420 880-10295 01
- Efficient, lightweight dc/dc switching converter  
LEWIS-12809 880-10299 01
- Time-sharing switch for vacuum brazing  
MSC-18699 880-10412 07

**SWIVELS**

- Ball-joint grounding ring  
MSC-18824 880-10405 07

**SYNCHRONISM**

- Timing signal propagates without phase shift  
MSC-18777 880-10449 02
- Fiber optics transmit clock signal more reliably  
NPO-14749 880-10456 03

**SYNCHRONIZERS**

- Independent synchronizer for digital decoders  
MSC-16723 880-10004 01
- Microprocessor-controlled data synchronizer  
MSC-18535 880-10031 02
- RAM-Based frame synchronizer  
GSFC-12430 880-10164 02

**SYNCHRONOUS MOTORS**

- Speed control for synchronous motors  
MSC-18680 880-10444 01

**SYNCHRONOUS SATELLITES**

- Predicting and monitoring duststorms  
NPO-14277 880-10323 03

**SYNTHETIC FUELS**

- Coal conversion and synthetic-fuel production  
M-FS-25330 880-10070 04

**SYRINGES**

- Transferring small samples of viscous liquid  
MSC-18533 880-10069 04

**SYSTEMS ANALYSIS**

- System time-domain simulation  
MSC-18333 880-10292 09

**SYSTEMS ENGINEERING**

- Goddard mission analysis system  
GSFC-12392 880-10144 09

**T**

**TACKINESS**

- New pressure-sensitive silicone adhesive  
LANGLEY-12737 880-10495 04

**TANK GEOMETRY**

- Lightweight cryogenic vessel  
NPO-14794 880-10548 08

**TANKER SHIPS**

- Detection of tanker defects with infrared thermography  
LANGLEY-12655 880-10221 06

**TASK COMPLEXITY**

- Determining manufacturing cost from product complexity  
M-FS-25371 880-10439 09

**TEA LASERS**

- Tunable pulsed carbon dioxide laser  
NPO-14984 880-10458 03

**TECHNOLOGY ASSESSMENT**

- Should we industrialize space?  
M-FS-23963 880-10137 08

**TEFLON (TRADEMARK)**

- Shrinking plastic tubing and nonstandard diameters  
MSC-18430 880-10268 08

**TELECOMMUNICATION**

- Dual-frequency bidirectional antenna  
GSFC-12501 880-10154 01
- Basic cluster compression algorithm  
NPO-14816 880-10291 09

**TELEMETRY**

- Microprocessor-controlled data synchronizer  
MSC-18535 880-10031 02
- Efficient telemetry format  
NPO-13679 880-10142 09
- RAM-Based frame synchronizer  
GSFC-12430 880-10164 02
- Receiver array for high-rate telemetry  
NPO-14579 880-10308 02
- Arrayed receivers for low-rate telemetry  
NPO-14590 880-10309 02
- Receiving signals of any polarization  
NPO-14836 880-10315 02
- Miniaturized physiological data telemetry system  
MSC-18804 880-10371 05

**TELEOPERATORS**

- Electromechanical slip sensor  
NPO-14654 880-10253 07

**TELESCOPES**

- Compact positioning flange  
MSC-14876 880-10104 07

**TELEVISION CAMERAS**

- Rotatable prism for pan and tilt  
LANGLEY-12388 880-10041 03
- Temperature-compensating dc restorer  
LANGLEY-12549 880-10152 01

**TELEVISION TRANSMISSION**

- Compressing TV-image data  
NPO-14823 880-10310 02

**TEMPERATURE**

- An equation of state for liquids  
NPO-14821 880-10174 03
- One-year assessment of a solar space/water heater--Clinton, Mississippi  
M-FS-25539 880-10477 03



**TEMPERATURE COMPENSATION**

Temperature-compensating dc restorer  
 LANGLEY-12549 B80-10152 01

**TEMPERATURE CONTROL**

Energy-saving thermostat  
 LANGLEY-12450 B80-10040 03  
 Controller and temperature monitor for solar heating  
 M-FS-25387 B80-10055 03  
 Temperature controller for hyperthermia devices  
 LANGLEY-12528 B80-10072 05  
 Final report on development of a programmable controller  
 M-FS-25388 B80-10189 03  
 Solar-heating and cooling demonstration project  
 M-FS-25443 B80-10203 03  
 Automatic thermal switches  
 GSFC-12553 B80-10214 06  
 Cooling/grounding mount for hybrid circuits  
 MSC-18728 B80-10302 01  
 Multiplexed logic controls solar-heating system  
 M-FS-25287 B80-10318 03  
 Heat for film processing from solar energy  
 M-FS-25444 B80-10331 03  
 Solar heater/cooler for mass market  
 M-FS-25452 B80-10332 03  
 Data-acquisition and control system for severe environments  
 M-FS-25471 B80-10333 03  
 Solar heater/cooler for mass market  
 M-FS-25468 B80-10334 03  
 Solar-heated and cooled office building--Dalton, Georgia  
 M-FS-25451 B80-10335 03  
 Solar-heating and hot water system--St. Louis, Missouri  
 M-FS-25453 B80-10336 03  
 Solar heating for an electronics manufacturing plant--Blue Earth, Minnesota  
 M-FS-25469 B80-10337 03  
 Costs and description of a solar-energy system--Austin, Texas  
 M-FS-25472 B80-10338 03  
 Solar energy in a historical city--Abbreville, South Carolina  
 M-FS-25479 B80-10339 03  
 municipal recreation center is heated and cooled by solar energy  
 M-FS-25478 B80-10340 03  
 Solar energy meets 50 percent of motel hot water needs--Key West, Florida  
 M-FS-25454 B80-10341 03  
 Solar heated office complex--Greenwood, South Carolina  
 M-FS-25458 B80-10342 03  
 Residential system tested in an office--Huntsville, Alabama  
 M-FS-25481 B80-10343 03  
 Solar heated two level residence--Akron, Ohio  
 M-FS-25480 B80-10344 03  
 Solar energy workshop--Tucson, Arizona  
 M-FS-25473 B80-10345 03  
 Residential solar hot water system--Tempe, Arizona  
 M-FS-25490 B80-10346 03  
 Residential solar heating installation--Stillwater, Minnesota  
 M-FS-25504 B80-10347 03

Three story residence with solar heat--Manchester, New Hampshire  
 M-FS-25499 B80-10348 03  
 A high school is supplied with solar energy--Dallas, Texas  
 M-FS-25514 B80-10349 03  
 Holes help control temperature  
 GSFC-12618 B80-10373 06  
 Temperature controller adapts to fatigue tester  
 LANGLEY-12393 B80-10378 06  
 Heat/pressure seal for moving parts  
 MSC-18422 B80-10390 06  
 Heat switch has no moving parts  
 GSFC-12625 B80-10391 06  
 Evaluation of an evacuated-tube liquid solar collector  
 M-FS-25450 B80-10461 03  
 Solar water heater design package  
 M-FS-25521 B80-10462 03  
 Five-city economics of a solar hot-water-system  
 M-FS-25532 B80-10463 03  
 Economic evaluation of a solar hot-water-system  
 M-FS-25529 B80-10464 03  
 Residential solar-heating system uses pyramidal optics  
 M-FS-25567 B80-10465 03  
 Solar-heated bank-Marks Mississippi  
 M-FS-25558 B80-10466 03  
 Solar water-heating performance evaluation--San Diego, California  
 M-FS-25502 B80-10467 03  
 Solar-heated and cooled savings and loan building-1-Leavenworth, Kansas  
 M-FS-25520 B80-10468 03  
 Solar-energy landmark  
 Building-Columbia, Missouri  
 M-FS-25524 B80-10469 03  
 Solar heating for an observatory--Lincoln, Nebraska  
 M-FS-25525 B80-10470 03  
 Two-story residence with solar heating--Newman, Georgia  
 M-FS-25526 B80-10471 03  
 Solar-energy heats a transportation test center--Pueblo, Colorado  
 M-FS-25527 B80-10472 03  
 Single-family-residence solar heating--Carlsbad, New Mexico  
 M-FS-25528 B80-10473 03  
 Multimode solar-heating system--Columbia, South Carolina  
 M-FS-25552 B80-10474 03  
 Solar-heated swimming school--Wilmington, Delaware  
 M-FS-25548 B80-10475 03  
 Winter performance of a domestic solar-heating system--Duffield, Virginia  
 M-FS-25540 B80-10476 03  
 Fire-station solar-energy system--Kansas City, Missouri  
 M-FS-25538 B80-10478 03  
 Solar-heated ranger station--Glendo, Wyoming  
 M-FS-25537 B80-10479 03  
 Economic evaluation of a solar hot-water system--Palm Beach County, Florida  
 M-FS-25536 B80-10480 03  
 Residential system--Lansing, Michigan  
 M-FS-25530 B80-10481 03  
 Solar space-heating system--Yosemite National Park, California  
 M-FS-25553 B80-10482 03

Motel solar-hot-water system--Dallas, Texas  
 M-FS-25575 B80-10483 03  
 Motel solar-hot-water system with nonpressurized storage--Jacksonville, Florida  
 M-FS-25569 B80-10484 03  
 Closed-circulation system for motel hot water--Savannah, Georgia  
 M-FS-25572 B80-10485 03  
 Solar heating for a restaurant--North Little Rock, Arkansas  
 M-FS-25568 B80-10486 03  
 Motel solar hot-water installation--Atlanta, Georgia  
 M-FS-25564 B80-10487 03  
 Building with integral solar-heat storage--Starkville, Mississippi  
 M-FS-25559 B80-10488 03  
 Less-toxic corrosion inhibitors  
 M-FS-25496 B80-10497 04  
 An oven for many thermocouple reference junctions  
 FRC-10112 B80-10506 06

**TEMPERATURE DISTRIBUTION**

Thermal stratification in liquid storage tanks  
 M-FS-25416 B80-10188 03  
 Heat conduction in three dimensions  
 MSC-18616 B80-10239 06  
 Simplified thermal analyzer  
 GSFC-12638 B80-10393 06

**TEMPERATURE GRADIENTS**

Electrofluidic accelerometer  
 LANGLEY-12493 B80-10225 06  
 Heat-pipe sensor for remote leveling  
 GSFC-12095 B80-10248 07  
 Measuring the thermal conductivity of insulation  
 NPO-14871 B80-10382 06

**TEMPERATURE MEASURING INSTRUMENTS**

Measuring the thermal conductivity of insulation  
 NPO-14871 B80-10382 06

**TEMPERATURE SCALES**

A temperature fixed point near 58 C  
 M-FS-25304 B80-10204 04

**TEMPERATURE SENSORS**

Signal conditioner for nickel temperature sensors  
 MSC-18367 B80-10298 01

**TENSILE TESTS**

Tension-mode loading for bend specimens in cryogenics  
 LEWIS-13040 B80-10076 06  
 Testing panels in tension and flexure  
 M-FS-25421 B80-10380 06

**TEST EQUIPMENT**

Online assessment of a distributed processor  
 KSC-11124 B80-10037 02  
 Temperature controller adapts to fatigue tester  
 LANGLEY-12393 B80-10378 06  
 CADAT test pattern generator  
 M-FS-25066 B80-10433 08  
 Solar-site test module  
 M-FS-25543 B80-10460 03

**TEST FACILITIES**

Environmental testing under load  
 LANGLEY-12602 B80-10379 06  
 Testing panels in tension and flexure  
 M-FS-25421 B80-10380 06

**TETHERING**

Eliminating gaps in split rings  
 MSC-18854 B80-10540 08

# **THERMAL CONDUCTIVITY**

Measuring the thermal conductivity of insulation  
NPO-14871 B80-10382 06

# **THERMAL CONDUCTIVITY GAGES**

Measuring the thermal conductivity of insulation  
NPO-14871 B80-10382 06

# **THERMAL CONDUCTORS**

An oven for many thermocouple reference junctions  
FRC-10112 B80-10506 06

# **THERMAL CONTROL COATINGS**

Corrosion-resistant ceramic thermal barrier coating  
LEWIS-13088 B80-10067 04  
Improved metallic and thermal barrier coatings  
LEWIS-13324 B80-10353 04

# **THERMAL DIFFUSION**

Systems improved numerical differencing analyzer  
MSC-18597 B80-10148 09

# **THERMAL DIFFUSIVITY**

Changes in 'thermal lens' measure diffusivity  
NPO-14657 B80-10218 06

# **THERMAL EXPANSION**

Composites with nearly zero thermal expansion  
MSC-18724 B80-10355 04

# **THERMAL FATIGUE**

Low cost high temperature, duplex coating for superalloys  
LEWIS-13497 B80-10352 04

# **THERMAL INSULATION**

Cryogenic-storage-tank support  
MSC-14848 B80-10258 07  
Thermal barrier and gas seal  
MSC-18390 B80-10269 08  
Measuring the thermal conductivity of insulation  
NPO-14871 B80-10382 06  
Reflecting layers reduce weight of insulation  
MSC-18785 B80-10547 08

# **THERMAL PROTECTION**

Heat/pressure seal for moving parts  
MSC-18422 B80-10390 06

# **THERMAL RESISTANCE**

Heat resistant polyphosphazene polymers  
ARC-11176 B80-10350 04  
Aluminum ions enhance polyimide adhesive  
LANGLEY-12640 B80-10358 04

# **THERMAL STRESSES**

Simplified thermal analyzer  
GSFC-12638 B80-10393 06

# **THERMOCLINES**

Thermal stratification in liquid storage tanks  
M-FS-25416 B80-10188 03

# **THERMOCOUPLES**

An oven for many thermocouple reference junctions  
FRC-10112 B80-10506 06

# **THERMODYNAMIC EFFICIENCY**

Benefit assessment of solar-augmented natural gas systems  
NPO-14568 B80-10048 03  
Outdoor tests of the concentric-tube collector  
M-FS-25398 B80-10191 03

# **THERMODYNAMIC PROPERTIES**

Thermodynamic and transport properties of air/water mixtures  
LEWIS-13432 B80-10519 06

# **THERMODYNAMICS**

An equation of state for liquids  
NPO-14821 B80-10174 03

# **THERMOPLASTIC RESINS**

Resistance welding graphite-fiber composites  
MSC-18534 B80-10264 08  
Plastic welder  
LANGLEY-12540 B80-10274 08

# **THERMOSIPHONS**

Thermosiphon heat exchanger  
M-FS-25389 B80-10053 03

# **THERMOSTATS**

Energy-saving thermostat  
LANGLEY-12450 B80-10040 03  
Automatic thermal switches  
GSFC-12553 B80-10214 06

# **THICKNESS**

Electronic depth micrometer  
KSC-11181 B80-10385 06

# **THIN FILMS**

Models of MOS and SOS devices  
M-FS-25153 B80-10141 08  
'Pelled-film' solar cells  
NPO-14734 B80-10151 01  
Electrically conductive palladium-containing polyimide films  
LANGLEY-12629 B80-10357 04  
Film coatings for contoured surfaces  
MSC-18784 B80-10425 08

# **THRESHOLD GATES**

LSI logic for phase-control rectifiers  
M-FS-25208 B80-10161 01

# **THRUST BEARINGS**

Self-acting shaft seals  
LEWIS-13229 B80-10109 07

# **TIDAL WAVES**

Oceanic-wave-measurement system  
M-FS-23862 B80-10224 06

# **TIGHTNESS**

Bolt-tension indicator  
M-FS-19324 B80-10105 07

# **TILES**

'Densified' tiles form stronger bonds  
MSC-18741 B80-10534 08  
Tile densification with TEOS  
MSC-18737 B80-10535 08  
Repairing high-temperature glazed tiles  
MSC-18736 B80-10536 08

# **TIME LAG**

Improved code-tracking loop  
MSC-18035 B80-10034 02  
Portable zero-delay assembly  
NPO-14671 B80-10316 02  
Timing signal propagates without phase shift  
MSC-18777 B80-10449 02

# **TIME MEASUREMENT**

Multichannel coincidence circuit  
LANGLEY-12531 B80-10005 01

# **TIME SHARING**

Time-shaped RF brazing  
MSC-18617 B80-10272 08  
Common data buffer  
KSC-11048 B80-10303 02  
Time-sharing switch for vacuum brazing  
MSC-18699 B80-10412 07

# **TIME SIGNALS**

Timing signal propagates without phase shift  
MSC-18777 B80-10449 02

Fiber optics transmit clock signal more reliably  
NPO-14749 B80-10456 03

# **TIMING DEVICES**

Camera add-on records time of exposure  
LANGLEY-12635 B80-10183 03  
Timing signal propagates without phase shift  
MSC-18777 B80-10449 02  
Fiber optics transmit clock signal more reliably  
NPO-14749 B80-10456 03

# **TIRES**

Chlorinolysis reclaims rubber of waste tires  
NPO-14935 B80-10365 04

# **TITANIUM CARBIDES**

Improved adherence of TiC coatings to steel  
LEWIS-13169 B80-10207 04

# **TITANIUM OXIDES**

Photoproduction of halogens using platinized TiO<sub>2</sub>  
LANGLEY-12713 B80-10491 04

# **TOOLS**

Tubing cutter for tight spaces  
MSC-18538 B80-10099 07  
Aluminum-encased lead mallet  
MSC-18529 B80-10100 07  
Measuring ball-bearing loads  
M-FS-19505 B80-10102 07  
Zero-torque spanner wrench  
MSC-14843 B80-10107 07  
Wire harness twisting aid  
MSC-18581 B80-10132 08  
Adjustable base for centering staked bearings  
MSC-19660 B80-10133 08  
Tube flare inspection tool  
MSC-19636 B80-10241 07  
Locknut preload tool  
MSC-16153 B80-10245 07  
Handtool assists in bundling cables  
MSC-18567 B80-10255 07  
Sleeve puller salvages welded tubes  
MSC-18686 B80-10256 07  
Tube-welder aids  
MSC-18687 B80-10277 08  
Drilling at right angles in blind holes  
M-FS-19535 B80-10403 07  
Torque-wrench extension  
MSC-18769 B80-10414 07  
Wrench for smooth or damaged fasteners  
MSC-18772 B80-10416 07  
Cutting holes in fabric-faced panels  
MSC-18786 B80-10427 08

# **TORQUE**

Zero-torque spanner wrench  
MSC-14843 B80-10107 07  
Torque control for electric motors  
MSC-18635 B80-10170 02  
Locknut preload tool  
MSC-16153 B80-10245 07

# **TORQUEMETERS**

Eddy-current sensor measures bolt loading  
M-FS-19486 B80-10079 06  
Bolt-tension indicator  
M-FS-19324 B80-10105 07  
Torque-wrench extension  
MSC-18769 B80-10414 07

# **TRACE CONTAMINANTS**

Bulk lifetime indicates surface contamination  
NPO-14966 B80-10511 06

**TRACKING (POSITION)**

Position monitor for mining machines  
M-FS-25342 880-10157 01  
Fresnel lens tracking solar collector  
M-FS-25419 880-10190 03  
Four-cell solar tracker  
NPO-14811 880-10319 03

**TRACKING FILTERS**

Continuous control of phase-locked-loop bandwidth  
MSC-16684 880-10008 01

**TRACTION**

High-performance, multiroller traction drive  
LEWIS-13347 880-10244 07

**TRAINING DEVICES**

Learning high-quality soldering  
NPO-14869 880-10539 08

**TRAJECTORY OPTIMIZATION**

Cost-minimized aircraft trajectories  
ARC-11282 880-10396 06

**TRANSDUCERS**

Broadband electrostatic acoustic transducer for liquids  
LANGLEY-12465 880-10078 06  
Linearizing magnetic-amplifier dc transducer output  
NPO-14617 880-10167 02  
Compliant transducer measures artery profile  
NPO-14899 880-10369 05  
Fiber optic accelerometer  
LEWIS-13219 880-10389 06  
Transducer for extreme temperatures and pressures  
MSC-18778 880-10510 06

**TRANSFER TUNNELS**

A versatile tunnel acts as a flexible duct  
M-FS-22636 880-10242 07

**TRANSFORMERS**

LVDT gage for fracture-toughness tests in liquid hydrogen  
LEWIS-13038 880-10075 06  
Producing gapped-ferrite transformer cores  
NPO-14715 880-10273 08  
28-Channel rotary transformer  
NPO-14861 880-10300 01  
Improved magnetic material analyzer  
LEWIS-13493 880-10384 06

**TRANSIENT RESPONSE**

Rotor transient analysis  
LEWIS-13230 880-10259 07

**TRANSISTOR LOGIC**

A general logic structure for custom LSI's  
NPO-14410 880-10118 08

**TRANSISTORS**

JANTX2N2060 dual transistor  
M-FS-25251 880-10018 01  
JANTX2N2219A dual transistor  
M-FS-25252 880-10019 01  
JANTX2N2369A transistor  
M-FS-25254 880-10020 01  
JANTX2N2432A transistor  
M-FS-26255 880-10021 01  
JANTX2N2484 transistor  
M-FS-25253 880-10022 01  
JANTX2N2605 transistor  
M-FS-25150 880-10023 01  
JANTX2N2905A transistor  
M-FS-25256 880-10024 01  
JANTX2N2920 Dual transistor  
M-FS-25258 880-10025 01  
JANTX2N2945A transistor  
M-FS-25259 880-10026 01

JANTX2N3637 transistor  
M-FS-25264 880-10027 01  
JANTX2N3811 dual transistor  
M-FS-25265 880-10028 01  
JANTX2N4150 transistor  
M-FS-25267 880-10029 01  
JANTX2N4856 field-effect transistor  
M-FS-25269 880-10030 01  
Transistor package for high pressure applications  
MSC-18743 880-10430 08

**TRANSLATING**

OCCULT-ORSER complete  
conversational user-language translator  
GSFC-12604 880-10556 09

**TRANSMISSION EFFICIENCY**

Efficient telemetry format  
NPO-13679 880-10142 09

**TRANSMITTERS**

High-power solid-state microwave transmitter  
NPO-14803 880-10296 01

**TRANSONIC FLOW**

Transonic airfoil design code  
LANGLEY-12460 880-10085 06  
Stream tube curvature analysis  
LANGLEY-11535 880-10235 06  
Inviscid transonic flow over axisymmetric bodies  
LANGLEY-12499 880-10398 06  
Transonic flow over wing/fuselage configurations  
LANGLEY-12702 880-10525 06

**TRANSPONDERS**

Microprocessor control for phase-lock receiver  
NPO-14438 880-10033 02  
Microprocessor-based detector for PSK commands  
NPO-14440 880-10036 02

**TRANSPORT PROPERTIES**

Thermodynamic and transport properties of air/water mixtures  
LEWIS-13432 880-10519 06

**TREES (MATHEMATICS)**

Equations of motion for coupled n-body systems  
GSFC-12407 880-10083 06

**TUMORS**

Temperature controller for hyperthermia devices  
LANGLEY-12528 880-10072 05

**TUNING**

Ultrastable automatic frequency control  
MSC-18679 880-10294 01

**TURBINE BLADES**

Analysis of a cooled, turbine blade or vane with an insert  
LEWIS-13293 880-10400 06

**TURBINE ENGINES**

Composites for aeropropulsion  
LEWIS-13438 880-10209 04

**TURBINES**

Regenerative superheated steam turbine cycles  
LEWIS-13392 880-10234 06

**TURBOFAN ENGINES**

Suppressing buzz-saw noise in jet engines  
LANGLEY-12645 880-10220 06

**TURBULENCE**

Extracting energy from natural flow  
M-FS-23989 880-10045 03  
Aeosol lasts up to six minutes  
NPO-14947 880-10360 04

**TURBULENT WAKES**

Wakeflow analysis by cost  
NPO-14705 880-10387 06

**TWISTING**

Wire harness twisting aid  
MSC-18581 880-10132 08

**U****ULTRASONIC RADIATION**

Acoustic lens is gas-filled  
NPO-14757 880-10376 06

**ULTRASONIC TESTS**

Broadband electrostatic acoustic transducer for liquids  
LANGLEY-12465 880-10078 06  
Verifying root fusion in electron-beam welds  
M-FS-19499 880-10110 08  
Fresnel lenses for ultrasonic inspection  
MSC-18469 880-10217 06  
Ultrasonic frequency analysis  
LANGLEY-12697 880-10377 06  
Microprocessor-controlled ultrasonic plethysmograph  
MSC-18759 880-10500 05  
Beef grading by ultrasound  
NPO-14812 880-10505 05

**ULTRASONICS**

Improved ureteral stone fragmentation catheter  
NPO-14745 880-10370 05

**ULTRAVIOLET PHOTOGRAPHY**

Detecting contaminants by ultraviolet photography  
M-FS-25296 880-10229 06

**ULTRAVIOLET RADIATION**

Miniature personal UV solar dosimeter  
LANGLEY-12469 880-10321 03  
Economical ultraviolet radiometer  
NPO-14843 880-10322 03

**ULTRAVIOLET SPECTROMETERS**

Ultraviolet spectrometer/polarimeter  
M-FS-25298 880-10042 03

**ULTRAVIOLET SPECTROPHOTOMETERS**

UV actinometer film  
NPO-14479 880-10179 03

**USER MANUALS (COMPUTER PROGRAMS)**

User's guide to SFTRAN  
LEWIS-13172 880-10143 09

**USER REQUIREMENTS**

Goddard mission analysis system  
GSFC-12392 880-10144 09

**V****VACUUM APPARATUS**

Knife-edge seal for vacuum bagging  
M-FS-24049 880-10135 08  
Time-sharing switch for vacuum brazing  
MSC-18699 880-10412 07  
Kilovolt vacuum feed through is less noisy  
NPO-14802 880-10426 08

**VACUUM TESTS**

Integrated material-surface analyzer  
NPO-14702 880-10388 06

**VALVES**

Automatic shutoff valve  
MSC-19385 880-10097 07  
Zero-torque spanner wrench  
MSC-14843 880-10107 07

**VAPOR DEPOSITION**

Automatic chemical vapor deposition  
M-FS-25249 880-10431 08  
Producing silicon continuously  
NPO-14796 880-10537 08

**VARIANCE**

Multiple linear regression analysis  
M-FS-23764 880-10288 09

**VEHICLE WHEELS**

Four-wheel dual braking for automobiles  
LANGLEY-12687 880-10529 07

**VELOCITY DISTRIBUTION**

The design and analysis of low-speed airfoils  
LANGLEY-12727 880-10524 06

**VENTS**

Automatic shutoff valve  
MSC-19385 880-10097 07

**VERSATILITY**

Versatile modular scaffolds  
GSFC-12606 880-10406 07

**VIBRATION DAMPING**

Foam-filled cushions for sliding trays  
MSC-18565 880-10127 08

**VIBRATION MEASUREMENT**

Transducer for extreme temperatures and pressures  
MSC-18778 880-10510 06

**VIBRATION MODE**

Vibration modes and frequencies of structures  
LANGLEY-12647 880-10237 06

**VIBRATORY LOADS**

Passive wing/store flutter suppression  
LANGLEY-12468 880-10219 06

**VIDEO EQUIPMENT**

Real-time film recording from stroke-written CRT's  
LANGLEY-12529 880-10169 02  
Imager displays free fall in stop action  
NPO-14779 880-10509 06

**VISCOPLASTICITY**

Reduced viscosity interpreted for fluid/gas mixtures  
NPO-14976 880-10457 03

**VISCOSITY**

Three-dimensional potential flow  
LANGLEY-12623 880-10090 06  
Reduced viscosity interpreted for fluid/gas mixtures  
NPO-14976 880-10457 03

**VISCOUS FLOW**

Viscous characteristics analysis  
LANGLEY-12598 880-10084 06  
Improved multielement airfoil analysis  
LANGLEY-12489 880-10086 06  
Reduced viscosity interpreted for fluid/gas mixtures  
NPO-14976 880-10457 03

**VISCOUS FLUIDS**

Transferring small samples of viscous liquid  
MSC-18533 880-10069 04

**VOLTAGE CONVERTERS (DC TO DC)**

Direct-current converter for gas-discharge lamps  
MSC-18407 880-10156 01  
Efficient, lightweight dc/dc switching converter  
LEWIS-12809 880-10299 01

**VOLTAGE REGULATORS**

Simple buck/boost voltage regulator  
GSFC-12360 880-10003 01  
Frequency-controlled voltage regulator  
NPO-13633 880-10171 02

A redundant regulator control with low standby losses  
NPO-13165 880-10172 02

**VOLUME**

An equation of state for liquids  
NPO-14821 880-10174 03

**VORTEX SHEETS**

A generalized vortex lattice method  
LANGLEY-12636 880-10236 06

**VORTICES**

Extracting energy from natural flow  
M-FS-23989 880-10045 03

**W**

**WAKES**

Aeolus lasts up to six minutes  
NPO-14947 880-10360 04

**WARNING SYSTEMS**

Simple circuit monitors 'third wire' in ac lines  
M-FS-19457 880-10002 01

**WASTE ENERGY UTILIZATION**

Gas absorption/desorption temperature-differential engine  
NPO-14528 880-10513 06

**WASTE UTILIZATION**

Chlorinolysis reclaims rubber of waste tires  
NPO-14935 880-10365 04

**WASTES**

Recycling paper-pulp waste liquors  
NPO-14797 880-10492 04

**WATER**

Glycol/water evacuated-tube solar collector  
M-FS-25337 880-10052 03

**WATER POLLUTION**

Treating domestic wastewater with water hyacinths  
M-FS-23964 880-10368 05

**WATER QUALITY**

Measuring water properties from a moving boat  
LANGLEY-12325 880-10073 05  
Improved microbe detection in water samples  
LANGLEY-12709 880-10502 05

**WATER RECLAMATION**

Treating domestic wastewater with water hyacinths  
M-FS-23964 880-10368 05

**WATER TREATMENT**

Carbon scrubber  
MSC-16531 880-10356 04  
Treating domestic wastewater with water hyacinths  
M-FS-23964 880-10368 05

**WATER VAPOR**

Improved cell for water-vapor electrolysis  
MSC-16394 880-10489 04  
Thermodynamic and transport properties of air/water mixtures  
LEWIS-13432 880-10519 06

**WATER WAVES**

Oceanic-wave-measurement system  
M-FS-23862 880-10224 06

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- LEFEVER, A. E.**  
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- LEIFFER, J. L.**  
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- LESH, F. H.**  
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- LEVINE, S.**  
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- LEVINE, S. R.**  
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- LEWIS, B. F.**  
Integrated material-surface analyzer  
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- LEWIS, D. H.**  
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- LEWIS, J. C.**  
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- LI, S. P.**  
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- LINDMAYER, J.**  
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NPO-14853 B80-10544 08
- LINDOW, B. G.**  
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LEWIS-13346 B80-10314 02
- LINDSEY, W. C.**  
Timing signal propagates without phase shift  
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- LISAGOR, W. B.**  
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- LISLE, R. V.**  
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- LONG, M. J.**  
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M-FS-25342 B80-10157 01
- LUCE, N.**  
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- LUDWIG, L. P.**  
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- LUTES, G. F., JR.**  
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MSC-18407 B80-10156 01
- LYNN, J. J.**  
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- MACCONOCHIE, I. O.**  
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KSC-11181 B80-10385 06
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MSC-18728 B80-10302 01
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- MARGOLIS, J. S.**  
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Heat-pipe sensor for remote leveling  
GSFC-12095 B80-10248 07
- MARTIN, D. R.**  
Microprocessor-controlled data synchronizer  
MSC-18535 B80-10031 02
- MASERJIAN, J.**  
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- MATTOX, D. M.**  
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LEWIS-13412 B80-10267 08
- MCCLEESE, D. J.**  
Instrument remotely measures wind velocities  
NPO-14524 B80-10176 03
- MCDONALD, R. C.**  
Treating domestic wastewater with water hyacinths  
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GSFC-12392 B80-10144 09
- MCHATTON, A. D.**  
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- MCLYMAN, W. T.**  
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- MENAMARA, J. W.**  
Interchangeable spring modules for inertia measurements  
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- MEGIE, G. J.**  
Tunable pulsed carbon dioxide laser  
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- MEITNER, P. L.**  
Full-coverage film cooling  
LEWIS-13249 B80-10091 06
- MENZIES, R. T.**  
Tunable pulsed carbon dioxide laser  
NPO-14984 B80-10458 03
- MERRICK, H. F.**  
Oxide dispersion strengthened  
superalloy  
LEWIS-13589 B80-10351 04
- MERSERAU, G. A.**  
Sealing micropores in thin castings  
MSC-18623 B80-10428 08
- MEUNIER, G. E.**  
Tube flare inspection tool  
MSC-19636 B80-10241 07
- MIDDLEBROOK, R. D.**  
Efficient, lightweight dc/dc switching  
converter  
LEWIS-12809 B80-10299 01
- MILES, R. T.**  
Oceanic-wave-measurement system  
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- MILLER, B. W.**  
Transferring small samples of viscous  
liquid  
MSC-18533 B80-10069 04
- MILLER, C. G.**  
Gas absorption/desorption  
temperature-differential engine  
NPO-14528 B80-10513 06
- MILLER, G.**  
Soft container for explosive nuts  
MSC-18871 B80-10532 07
- MILLER, R. A.**  
Corrosion-resistant ceramic thermal  
barrier coating  
LEWIS-13088 B80-10067 04
- MILLER, W. E.**  
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LANGLEY-12513 B80-10009 01
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MSC-19751 B80-10158 01
- MINOTT, P. O.**  
Multibeam collimator uses prism stack  
GSFC-12608 B80-10452 03
- MIRANDA, L. R.**  
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Ion-beam etching enhances adhesive  
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LEWIS-13485 B80-10364 04
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M-F-25183 B80-10432 08
- MITCHELL, F. R.**  
Compact table-tilting mechanism  
NPO-14800 B80-10411 07
- MITCHELL, S. M.**  
Transferring small samples of viscous  
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MSC-18533 B80-10069 04  
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MSC-18740 B80-10494 04
- MOACANIN, J.**  
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NPO-14821 B80-10174 03  
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NPO-14657 B80-10218 06
- Compact infrared detector  
NPO-14864 B80-10515 06
- MONGAN, R. D.**  
Heat conduction in three dimensions  
MSC-18616 B80-10239 06
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M-FS-23720 B80-10061 04
- MOSHEY, E. A.**  
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- MOTAL, G. W.**  
Continuous control of phase-locked-loop  
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MSC-16684 B80-10008 01
- N**
- NADLER, H.**  
Transducer for extreme temperatures and  
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MSC-18778 B80-10510 06
- NAGANO, S.**  
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transducer output  
NPO-14617 B80-10167 02
- NAHIN, S. B.**  
Foam-filled cushions for sliding trays  
MSC-18565 B80-10127 08
- NASVYTIS, A.**  
High-performance, multiroller traction  
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LEWIS-13347 B80-10244 07
- NEISWANDER, D. W.**  
Detecting contaminants by ultraviolet  
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M-FS-25296 B80-10229 06
- NELSON, C. W.**  
X-ray beam pointer  
MSC-18590 B80-10254 07
- NEWBURNE, R.**  
Evaluating computer-drawn  
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KSC-11195 B80-10555 09
- NEWCOMB, A. L., JR.**  
Precision filament cutter  
LANGLEY-12564 B80-10093 07
- NICHOLAS, R. F.**  
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M-FS-19537 B80-10278 08
- NISEN, D. B.**  
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- NISWANDER, J. K.**  
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GSFC-12430 B80-10164 02  
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- NITZSCHKE, G. O.**  
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MSC-18623 B80-10428 08
- NOLA, F. J.**  
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- OAKLEY, J. W.**  
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inertia measurements  
LANGLEY-12402 B80-10386 06
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ARC-11176 B80-10350 04
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MSC-18623 B80-10428 08
- OGILVIE, P.**  
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M-FS-23027 B80-10089 06
- OHLSON, J. E.**  
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NPO-14836 B80-10315 02
- OLNEY, J. N.**  
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MSC-18533 B80-10069 04
- OLSON, A. J.**  
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MSC-18784 B80-10425 08
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- ORSZAG, S. A.**  
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NPO-14713 B80-10447 02
- OVERBEY, C. W.**  
Automatic shutoff valve  
MSC-19385 B80-10097 07
- OZYAZICI, E. M.**  
Input/output interface module  
MSC-18180 B80-10159 01
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Pulse-shaping circuit for laser excitation  
NPO-14556 B80-10453 03
- PACKARD, H.**  
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MSC-18680 B80-10444 01
- PALLAT, E. A.**  
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LEWIS-13145 B80-10286 09
- PAPAZIAN, J. M.**  
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M-FS-25205 B80-10366 04
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GSFC-12360 B80-10003 01
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MSC-18333 B80-10292 09

**PECK, S. R.**

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**PEERCY, R. L. JR.**

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**PESSIN, R.**

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**PETERS, J. W.**

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Silicon nitride passivation of IC's  
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**PETERSON, D. H.**

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MSC-18769 880-10414 07

**PETERSON, J.**

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**PETERSON, S. A.**

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MSC-18786 880-10427 08

**PHILLIPS, W. H.**

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**PIERCE, W. S.**

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Modified displacement gage for cryogenic testing  
LEWIS-13039 880-10077 06

**PIRVICS, J.**

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LEWIS-13393 880-10533 07

**PITTS, E. R.**

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M-FS-25055 880-10551 08

**PITTS, J.**

UV actinometer film  
NPO-14479 880-10179 03

**PIVIROTTI, T. J.**

Powerful copper chloride laser  
NPO-14782 880-10330 03

**PIZZECK, D. E.**

Easily-assembled helical heater  
LANGLEY-11712 880-10130 08

**PLAUTZ, K. A.**

Gage for evaluating rheumatoid hands  
GSFC-12610 880-10503 05

**POOLE, B. D., JR.**

Miniature personal UV solar dosimeter  
LANGLEY-12469 880-10321 03

**PORTNOY, W. M.**

Miniaturized physiological data telemetry system  
MSC-18804 880-10371 05

**POSTAL, R. B.**

High-power solid-state microwave transmitter  
NPO-14803 880-10296 01

**PRASTHOFER, W. P.**

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M-FS-25139 880-10409 07

**PRUSSIN, S.**

Model for MOS field-time-dependent breakdown  
NPO-14701 880-10162 01

Improving MOS minority-carrier lifetime  
NPO-14738 880-10301 01

**PRYCHKA, P.**

Cryogenic machining of polyurethane foam  
MSC-18572 880-10123 08

**PURVES, L.**

An all-FORTRAN version of NASTRAN for the VAX  
GSFC-12600 880-10522 06

**PUTNAM, L. E.**

Predicting propulsion system drag  
LANGLEY-12619 880-10238 06

**R****RAMAPRIYAN, H. K.**

OCCULT-ORSER complete conversational user-language translator  
GSFC-12604 880-10556 09

**RATHZ, T. J.**

Containerless materials processing in the laboratory  
M-FS-25242 880-10059 04

**RAUSCHL, J. A.**

Knife-edge seal for vacuum bagging  
M-FS-24049 880-10135 08

**RAVETTI, R. G.**

Cost models and economical packaging of LSI's  
M-FS-25359 880-10138 08

**RAYBORN, G. H.**

Improved LEEM ranges over four decades  
LANGLEY-12706 880-10508 06

**READ, W. S.**

Learning high-quality soldering  
NPO-14869 880-10539 08

**REASONER, R. B.**

Low-resistance continuity tester  
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**REDDY, G. B.**

Structural design with stress and displacement constraints  
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**REDMANN, J. J.**

Improved multispectral solar cell array  
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**REED, R. A.**

Cardiopulmonary data-acquisition system  
MSC-18783 880-10499 05

**REED, W. H., III**

Passive wing/store flutter suppression  
LANGLEY-12468 880-10219 06

**REICH, R.**

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**REICHMAN, B.**

Photoproduction of halogens using platinumized TiO<sub>2</sub>  
LANGLEY-12713 880-10491 04

**REID, H., JR.**

Detecting a coal/shale interface  
M-FS-23720 880-10061 04

**REINHARDT, V. S.**

Integral storage-bulb and microwave cavity for masers  
GSFC-12542 880-10186 03

**REMBAUM, A.**

Hybrid polymer microspheres  
NPO-14462 880-10208 04

**RHODES, D. B.**

Fiber-optics couple arthroscope to TV  
LANGLEY-12718 880-10504 05

**RICE, R. F.**

Compressing TV-image data  
NPO-14823 880-10310 02  
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NPO-14496 880-10438 09

**RICK, S. C.**

Dual mode actuator  
LANGLEY-12412 880-10106 07

**RILEY, T.**

Forming complex cavities in clear plastic  
LEWIS-13412 880-10267 08

**RIPPEL, W. E.**

Improved battery charger for electric vehicles  
NPO-14964 880-10440 01

**ROBB, P. H.**

'Grinding' cavities in polyurethane foam  
MSC-18564 880-10124 08  
Foam-filled cushions for sliding trays  
MSC-18565 880-10127 08

**ROBINSON, M. B.**

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M-FS-25242 880-10059 04

**ROCKOFF, H. J.**

Reflecting layers reduce weight of insulation  
MSC-18785 880-10547 08

**RODRIGUEZ, G. E.**

Simple buck/boost voltage regulator  
GSFC-12360 880-10003 01

**ROHN, D. A.**

High-performance, multiroller traction drive  
LEWIS-13347 880-10244 07

**ROSNER, R. S.**

Producing silicon continuously  
NPO-14796 880-10537 08

**ROTHROCK, C. W.**

Cost models and economical packaging of LSI's  
M-FS-25359 880-10138 08

**ROUSSEAU, C. R.**

Room-temperature adhesive for high-temperature use  
MSC-16930 880-10129 08

**RUIZ, W. V.**

Shrinking plastic tubing and nonstandard diameters  
MSC-18430 880-10268 08

**RUMMLER, D. R.**

An approximation to student's t-distribution  
LANGLEY-12238 880-10284 09

**RUNYAN, H. L., JR.**

Passive wing/store flutter suppression  
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**RUSS, C. E., JR.**

Gas-laser power monitor  
LANGLEY-12682 880-10455 03

**RUTT, G. S.**

Testing EKG electrodes on-line  
MSC-18696 880-10212 05

**RYAN, E.**

NASA PERT time II  
LEWIS-13145 880-10286 09

**RYAN, J. P.**

Structured FORTRAN preprocessor  
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Ultrastable automatic frequency control  
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- SALAMA, A. M.**  
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- SALISBURY, J. K., JR.**  
Remote manipulator with force  
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ARC-11272 B80-10408 07
- SANDEFUR, P. G., JR.**  
A construction technique for wind tunnel  
models  
LANGLEY-12710 B80-10381 06
- SANDERS, R. E.**  
Examining graphite reinforcement in  
composites  
MSC-19594 B80-10122 08
- SARBOLOUKI, M. N.**  
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NPO-14797 B80-10492 04
- SAUGLER, R. E.**  
Analysis of a cooled, turbine blade or  
vane with an insert  
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- SCHARMACK, D. K.**  
Frequency response for multiple-sampling  
rate systems  
MSC-18473 B80-10173 02
- SCHINDLER, R. A.**  
High-resolution spectrometry/inter-  
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NPO-14448 B80-10175 03
- SCHLESSINGER, E. D.**  
Reflecting layers reduce weight of  
insulation  
MSC-18785 B80-10547 08
- SCHLUFE, G.**  
Precision filament cutter  
LANGLEY-12564 B80-10093 07
- SCHLUTSMAYER, A. P.**  
Compressing TV-image data  
NPO-14823 B80-10310 02
- SCHMID, P. E.**  
Microcomputer-based doppler systems  
for weather monitoring  
GSFC-12448 B80-10166 02
- SCHMIT, L. A.**  
Resizing structures for minimum weight  
LANGLEY-12699 B80-10394 06
- SCHNEIDER, H. W.**  
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NPO-14801 B80-10271 08
- SCHOMBURG, C.**  
Tile densification with TEOS  
MSC-18737 B80-10535 08  
Repairing high-temperature glazed tiles  
MSC-18736 B80-10536 08
- SCHOTT, J.**  
Speed control for synchronous motors  
MSC-18680 B80-10444 01
- SCHUBERT, W. H.**  
Honing fixture for welded electrodes  
M-FS-19537 B80-10278 08
- SCHULLER, T. L.**  
Back contacts for silicon-on-ceramic  
solar cells  
NPO-14809 B80-10545 08
- SCOPELIANOS, A. G.**  
Heat resistant polyphosphazene  
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ARC-11176 B80-10350 04
- SCOTT, D. R.**  
Solar-site test module  
M-FS-25543 B80-10460 03
- SEAMAN, C. H.**  
Instrument remotely measures wind  
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